

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$                      | Package | $I_{D \max}$<br>$T_A = +25^\circ\text{C}$ |
|---------------|--|---------|---|
| -20V          | 60m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | SOT-23  | -4.0A                                     |
|               | 90m $\Omega$ @ $V_{GS} = -2.5\text{V}$ |         | -3.3A                                     |

## Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance ( $R_{DS(on)}$ ) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

## Features

- 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 DMP2065UQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

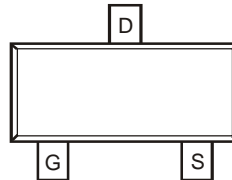
<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

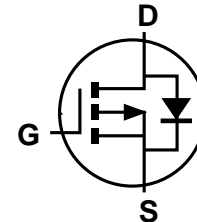
- Case: SOT23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Solderable per MIL-STD-202, Method 208  $\text{\textcircled{3}}$
- Lead-Free Plating (Matte Tin Finish Annealed over Alloy 42 Lead-Frame).
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)



Top View



Top View  
Pin Configuration



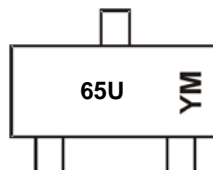
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number  | Case  | Packaging          |
|--------------|-------|--------------------|
| DMP2065UQ-7  | SOT23 | 3000/Tape & Reel   |
| DMP2065UQ-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



65U = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: H = 2020)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|------|------|------|------|------|------|------|------|
| Code | 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** (@  $T_A = +25^\circ\text{C}$  unless otherwise specified.)

| Characteristic   |              |                           | Symbol    | Value    | Units |
|--|--------------|---------------------------|-----------|----------|-------|
| Drain-Source Voltage   |              |                           | $V_{DSS}$ | -20      | V     |
| Gate-Source Voltage  |              |                           | $V_{GSS}$ | $\pm 12$ | V     |
| Drain Current (Note 6) $V_{GS} = -4.5\text{V}$                                   | Steady State | $T_A = +25^\circ\text{C}$ | $I_D$     | -4.0     | A     |
|  |              | $T_A = +70^\circ\text{C}$ |           | -3.0     |       |
| Pulsed Drain Current (Pulse width $\leq 10\mu\text{s}$ , Duty Cycle $\leq 1\%$ ) |              |                           | $I_{DM}$  | -15      | A     |

**Thermal Characteristics**

| Characteristic                                   |              |  | Symbol          | Value       | Unit               |
|--|--------------|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5)                 |              |  | $P_D$           | 0.9         | W                  |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State |  | $R_{\theta JA}$ | 138         | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 |              |  | $P_D$           | 1.5         | W                  |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State |  | $R_{\theta JA}$ | 83          | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          |              |  | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

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

| Characteristic                          | Symbol       | Min  | Typ  | Max      | Unit          | Test Condition  |
|---|--------------|------|------|----------|---------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>     |              |      |      |          |               |   |
| Drain-Source Breakdown Voltage          | $BV_{DSS}$   | -20  | —    | —        | V             | $V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$   |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | —    | —    | -1.0     | $\mu\text{A}$ | $T_J = +25^\circ\text{C}, V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$                               |
| Gate-Source Leakage                     | $I_{GSS}$    | —    | —    | $\pm 50$ | nA            | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$  |
| <b>ON CHARACTERISTICS (Note 7)</b>      |              |      |      |          |               |   |
| Gate Threshold Voltage                  | $V_{GS(th)}$ | -0.5 | —    | -0.9     | V             | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$  |
| Static Drain-Source On-Resistance       | $R_{DS(on)}$ | —    | 41   | 60       | m $\Omega$    | $V_{GS} = -4.5\text{V}, I_D = -4.2\text{A}$   |
|   |              |      | 53   | 90       |               | $V_{GS} = -2.5\text{V}, I_D = -3.4\text{A}$   |
|   |              |      | 72   | 113      |               | $V_{GS} = -1.8\text{V}, I_D = -2.0\text{A}$   |
| Diode Forward Voltage                   | $V_{SD}$     | —    | -0.7 | -1.1     | V             | $V_{GS} = 0\text{V}, I_S = -1\text{A}$  |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |              |      |      |          |               |   |
| Input Capacitance                       | $C_{iss}$    | —    | 808  | —        | pF            | $V_{DS} = -15\text{V}, V_{GS} = 0\text{V}$<br>$f = 1.0\text{MHz}$                                 |
| Output Capacitance                      | $C_{oss}$    | —    | 85   | —        | pF            |   |
| Reverse Transfer Capacitance            | $C_{rss}$    | —    | 77   | —        | pF            |   |
| Gate Resistance                         | $R_G$        | —    | 15.2 | —        | $\Omega$      | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1.0\text{MHz}$                                       |
| Total Gate Charge                       | $Q_g$        | —    | 10.2 | —        | nC            | $V_{GS} = -4.5\text{V}, V_{DS} = -4\text{V}, I_D = -3.5\text{A}$                                  |
| Gate-Source Charge                      | $Q_{gs}$     | —    | 1.3  | —        | nC            |   |
| Gate-Drain Charge                       | $Q_{gd}$     | —    | 2.2  | —        | nC            |   |
| Turn-On Delay Time                      | $t_{D(on)}$  | —    | 10.8 | —        | ns            | $V_{DS} = -4\text{V}, V_{GS} = -4.5\text{V},$<br>$R_L = 4\Omega, R_G = 6\Omega, I_D = -1\text{A}$ |
| Turn-On Rise Time                       | $t_r$        | —    | 13.7 | —        | ns            |   |
| Turn-Off Delay Time                     | $t_{D(off)}$ | —    | 79.3 | —        | ns            |   |
| Turn-Off Fall Time                      | $t_f$        | —    | 34.7 | —        | ns            |   |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1in. square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

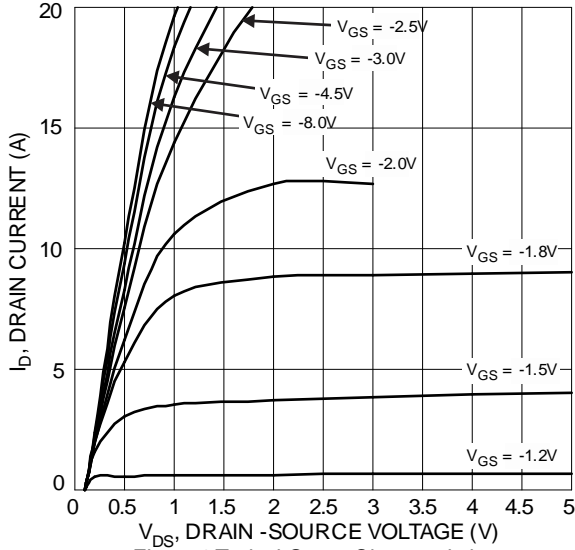


Figure 1 Typical Output Characteristics

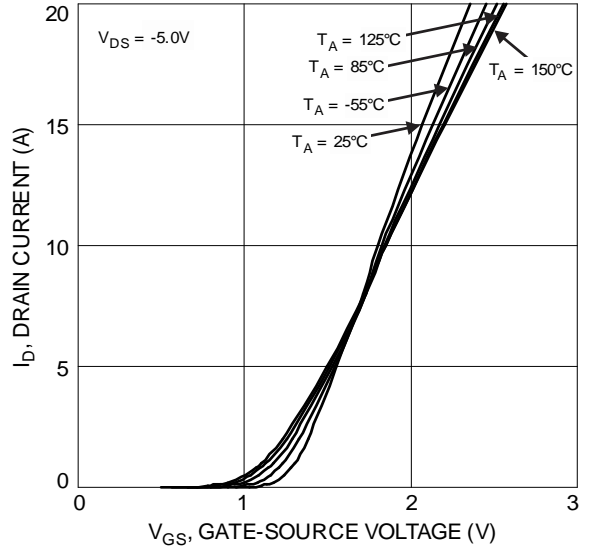


Figure 2 Typical Transfer Characteristics

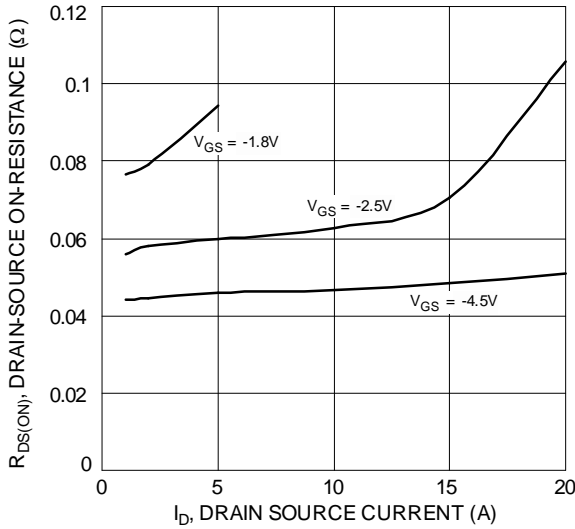


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

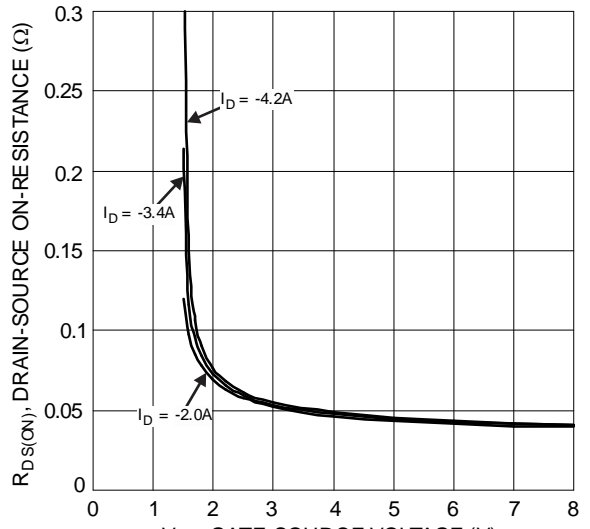


Figure 4 Typical Transfer Characteristics

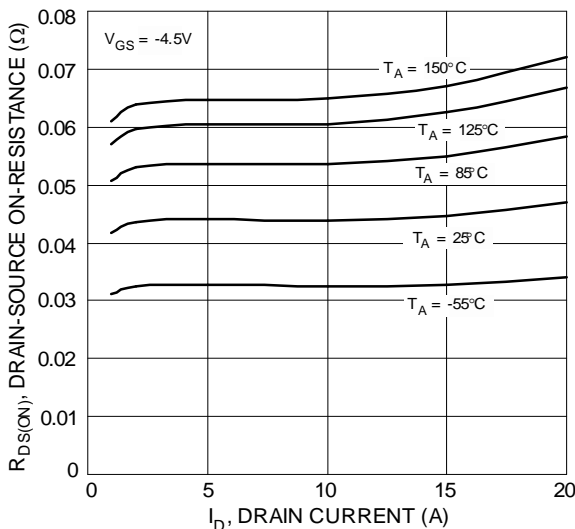


Figure 5 Typical On-Resistance vs. Drain Current and Junction Temperature

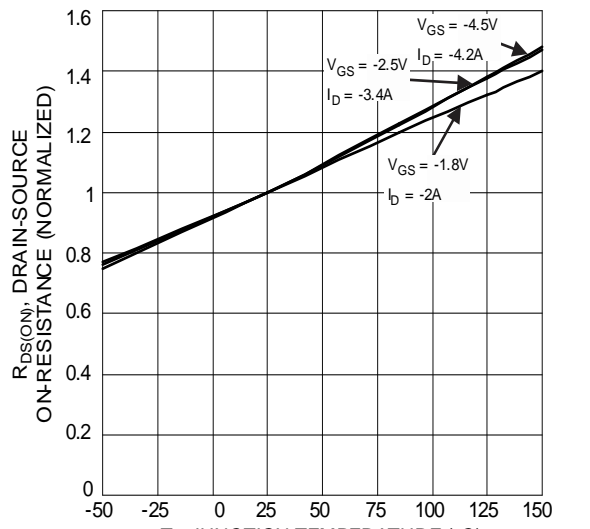


Figure 6 On-Resistance Variation with Junction Temperature

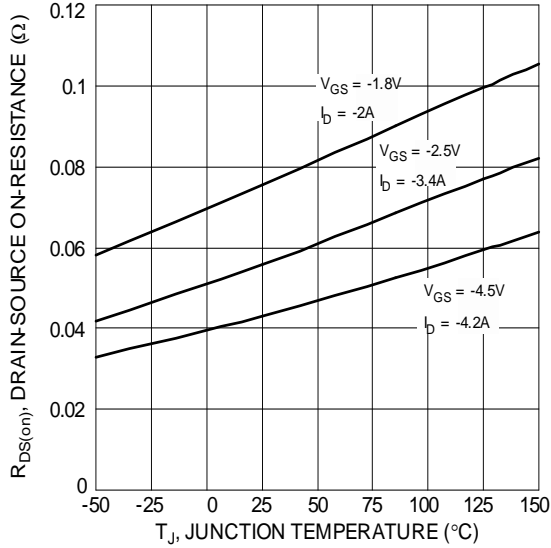


Figure 7 On-Resistance Variation with Junction Temperature

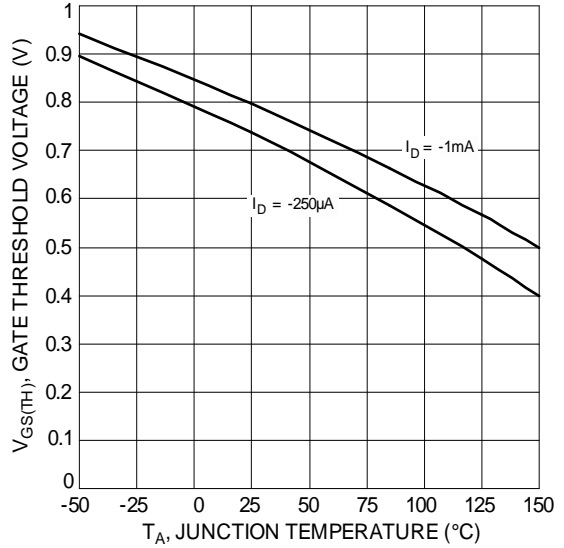


Figure 8 Gate Threshold Variation vs. Junction Temperature

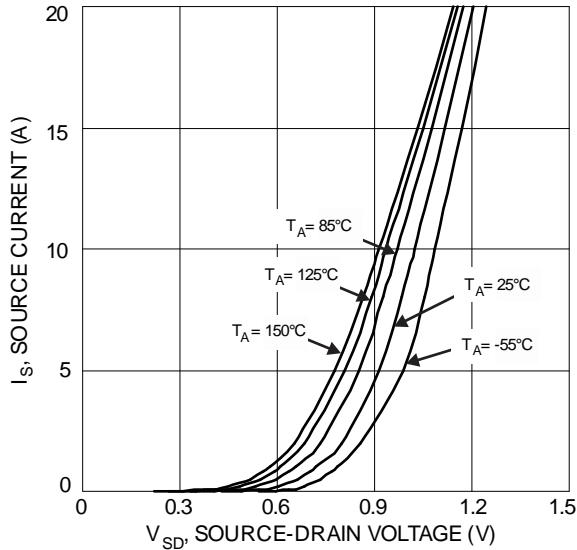


Figure 9 Diode Forward Voltage vs. Current

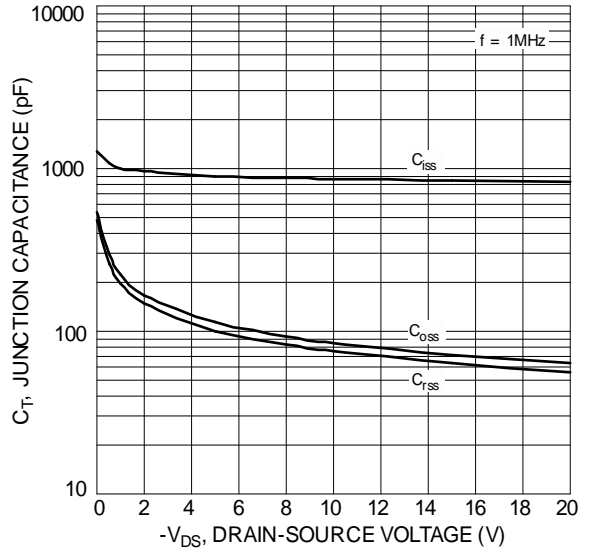


Figure 10 Typical Junction Capacitance

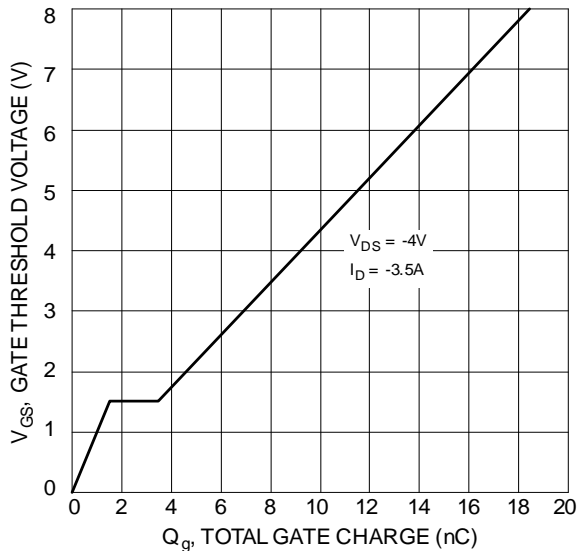


Figure 11 Gate Charge

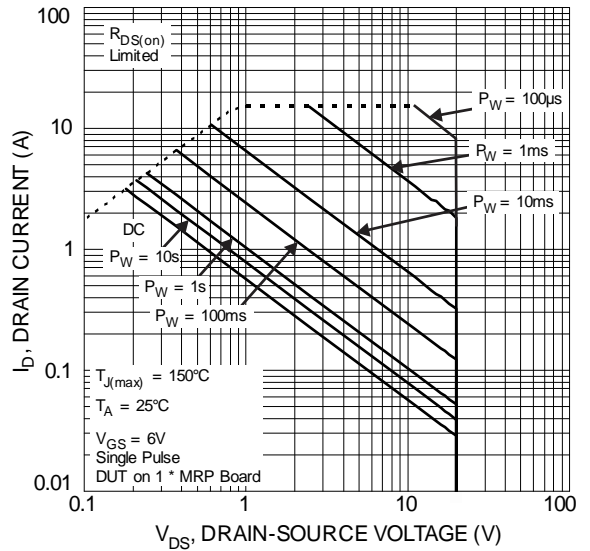


Figure 12 SOA, Safe Operation Area

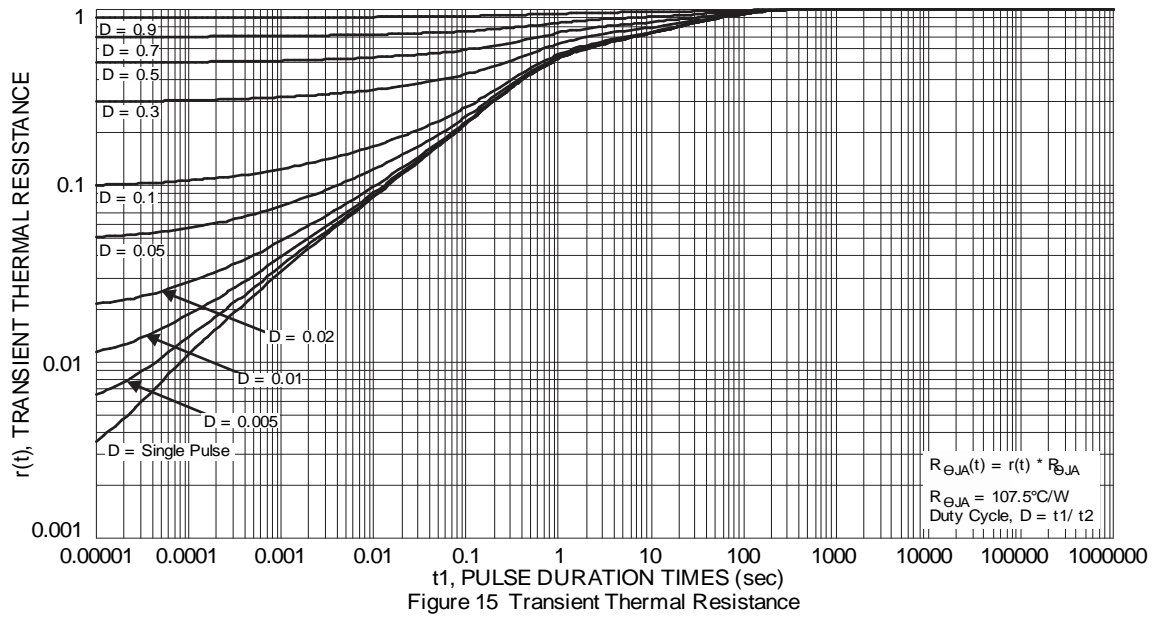
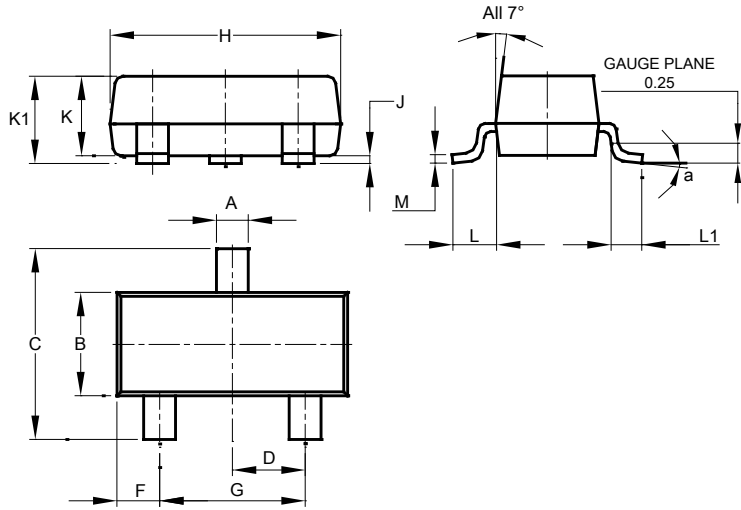


Figure 15 Transient Thermal Resistance

**Package Outline Dimensions**

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

**SOT23**

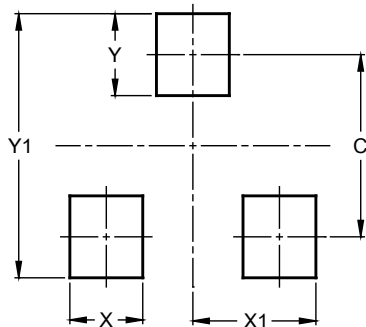


| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 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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