

## Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ max                    | $I_D$<br>$T_A = +25^\circ\text{C}$ |
|----------|-------------------------------------|------------------------------------|
| -50V     | 10 $\Omega$ @ $V_{GS} = -5\text{V}$ | -180mA                             |

## Description

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

## Applications

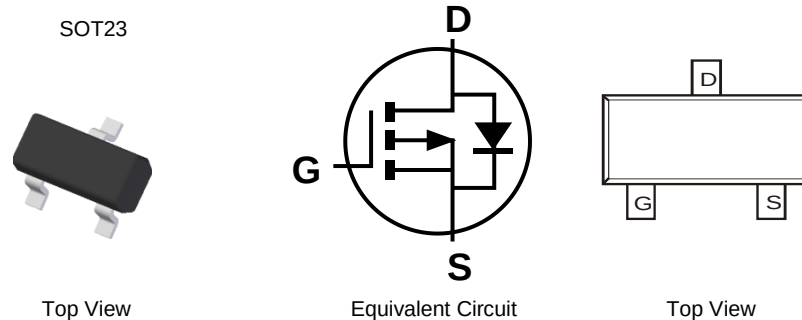
- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

## 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)**
- Qualified to AEC-Q101 Standards for High Reliability**

## 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  $\text{e3}$
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

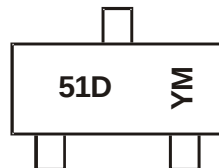


## Ordering Information (Note 4)

| Part Number | Case  | Packaging          |
|-------------|-------|--------------------|
| DMP510DL-7  | SOT23 | 3,000/Tape & Reel  |
| DMP510DL-13 | SOT23 | 10,000/Tape & Reel |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



51D = Product Type Marking Code  
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 Y or Y = Year (ex: C = 2015)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|------|------|------|------|------|------|------|------|------|
| Code | C    | D    | E    | F    | G    | H    | I    | J    |

| 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        | Units |
|---------------------------------------------------------|--------------|--------------------------------------------------|------------------|--------------|-------|
| Drain-Source Voltage                                    |              |                                                  | V <sub>DSS</sub> | -50          | V     |
| Gate-Source Voltage                                     |              |                                                  | V <sub>GSS</sub> | ±30          | 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>   | -180<br>-130 | mA    |
| Maximum Continuous Body Diode Forward Current (Note 6)  |              |                                                  | I <sub>S</sub>   | -0.5         | A     |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)      |              |                                                  | I <sub>DM</sub>  | -1.2         | A     |

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

| Characteristic                                   |              |  | Symbol                            | Value       | Units |
|--------------------------------------------------|--------------|--|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 |              |  | P <sub>D</sub>                    | 310         | mW    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State |  | R <sub>θJA</sub>                  | 405         | °C/W  |
| Total Power Dissipation (Note 6)                 |              |  | P <sub>D</sub>                    | 500         | mW    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State |  | R <sub>θJA</sub>                  | 251         | °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   | μA   | V <sub>DS</sub> = -50V, V <sub>GS</sub> = 0V                                                       |
| Gate-Source Leakage                     | I <sub>GSS</sub>    | —    | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, 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                                                      |
| Forward Transconductance                | g <sub>FS</sub>     | —    | 0.25 | —    | S    | V <sub>DS</sub> = -25V, I <sub>D</sub> = -0.1A                                                     |
| <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   |                                                                                                    |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | —    | 2.8  | —    | ns   | V <sub>DD</sub> = -30V, I <sub>D</sub> = -0.27A,<br>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.

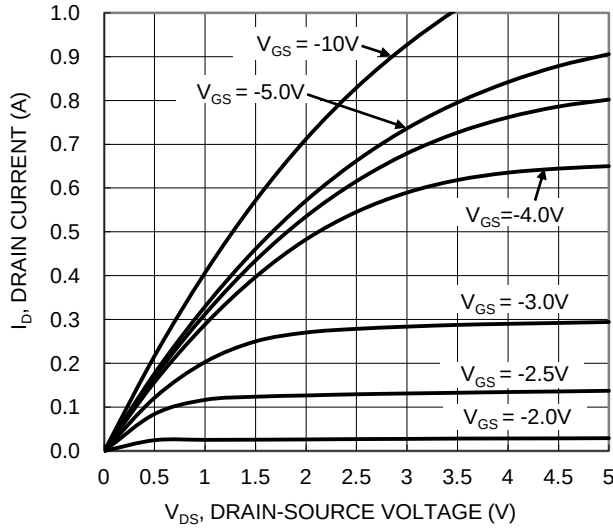


Figure 1. Typical Output Characteristic

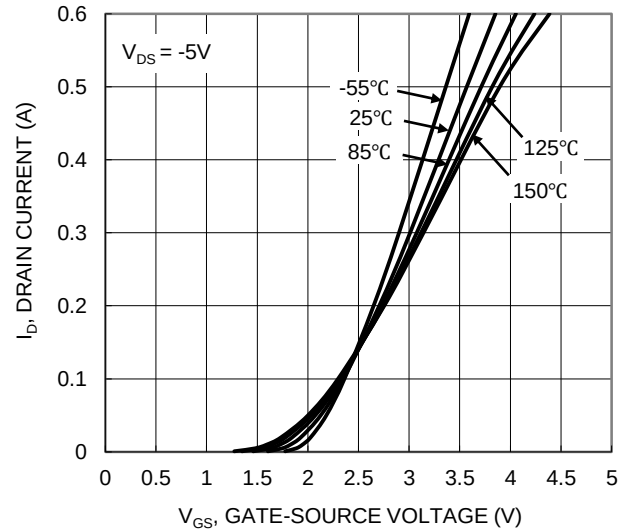


Figure 2. Typical Transfer Characteristic

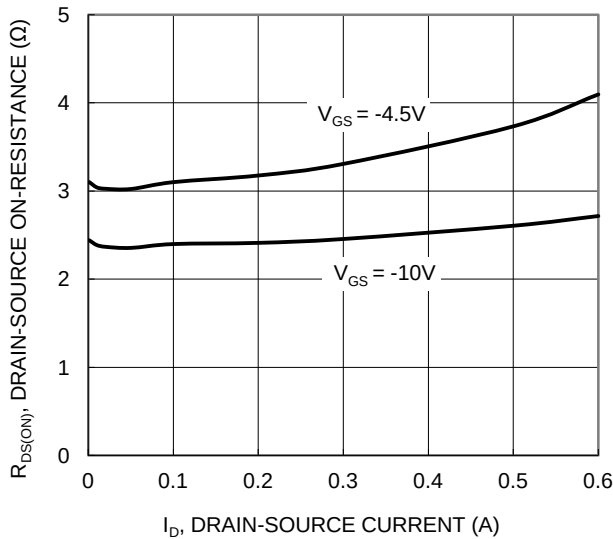


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

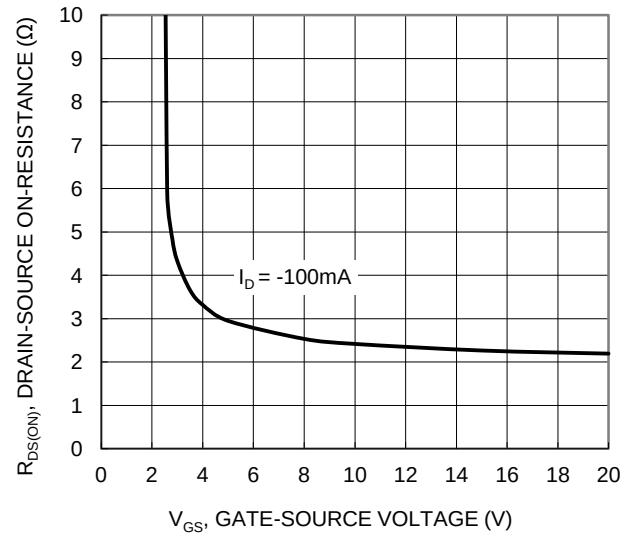


Figure 4. Typical Transfer Characteristic

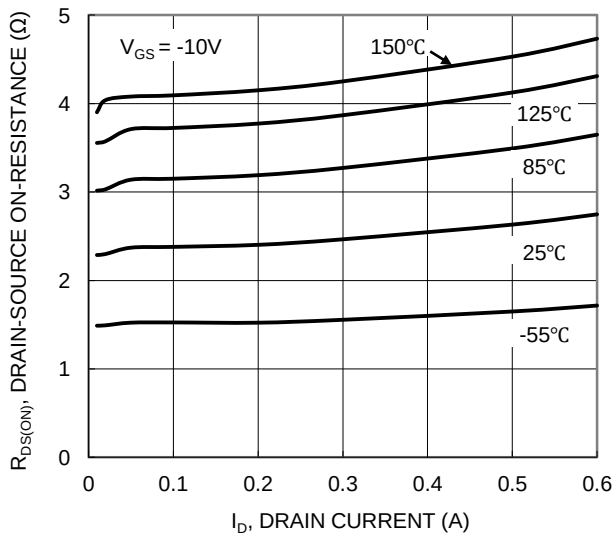


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

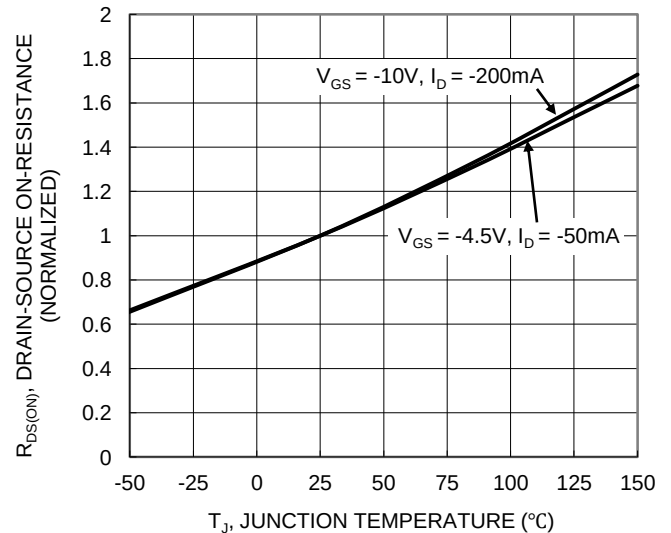


Figure 6. On-Resistance Variation with Temperature

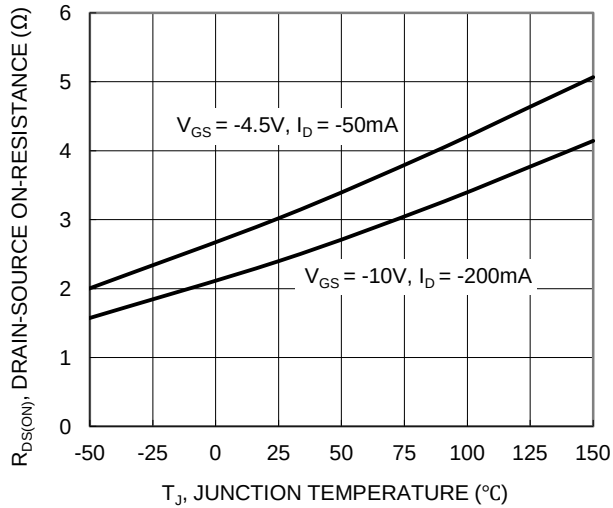


Figure 7. On-Resistance Variation with Temperature

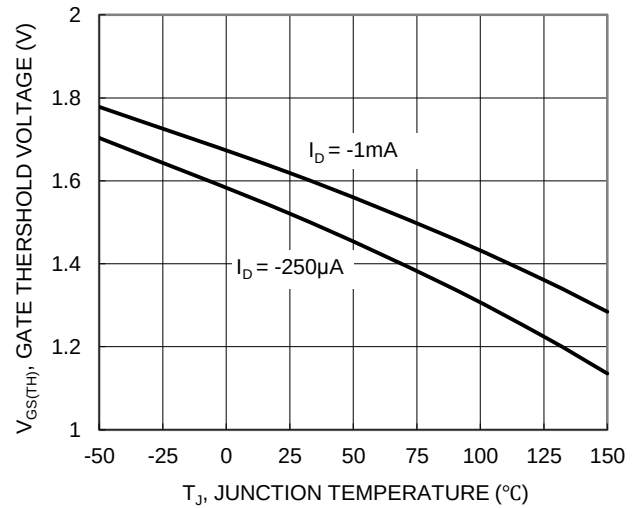


Figure 8. Gate Threshold Variation vs. Ambient Temperature

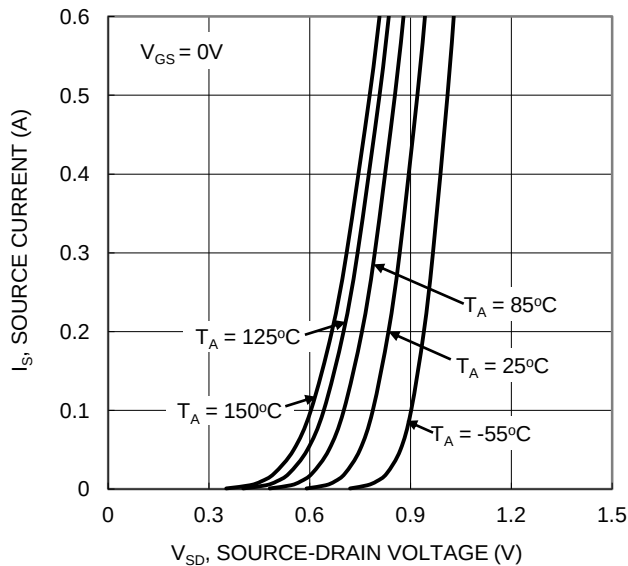


Figure 9. Diode Forward Voltage vs. Current

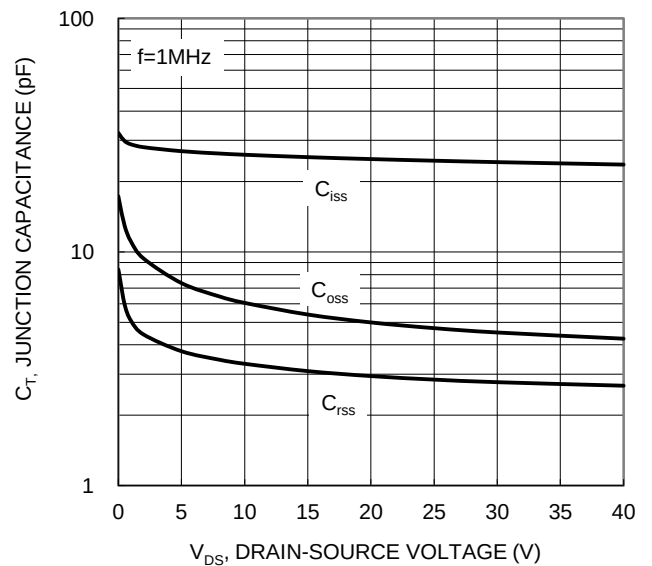


Figure 10. Typical Junction Capacitance

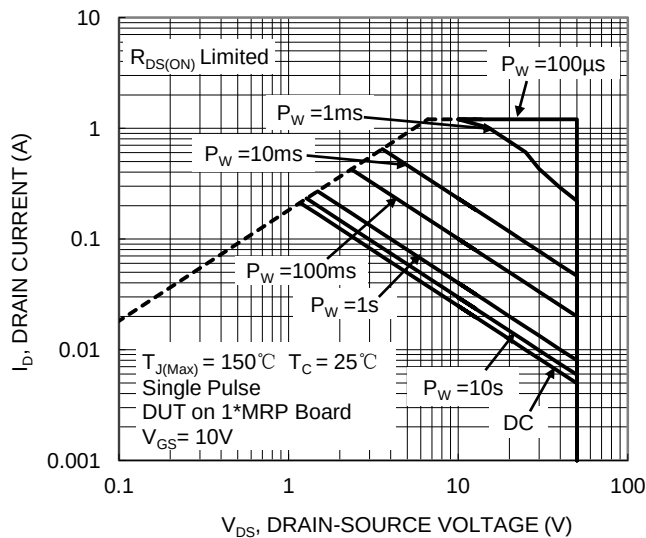
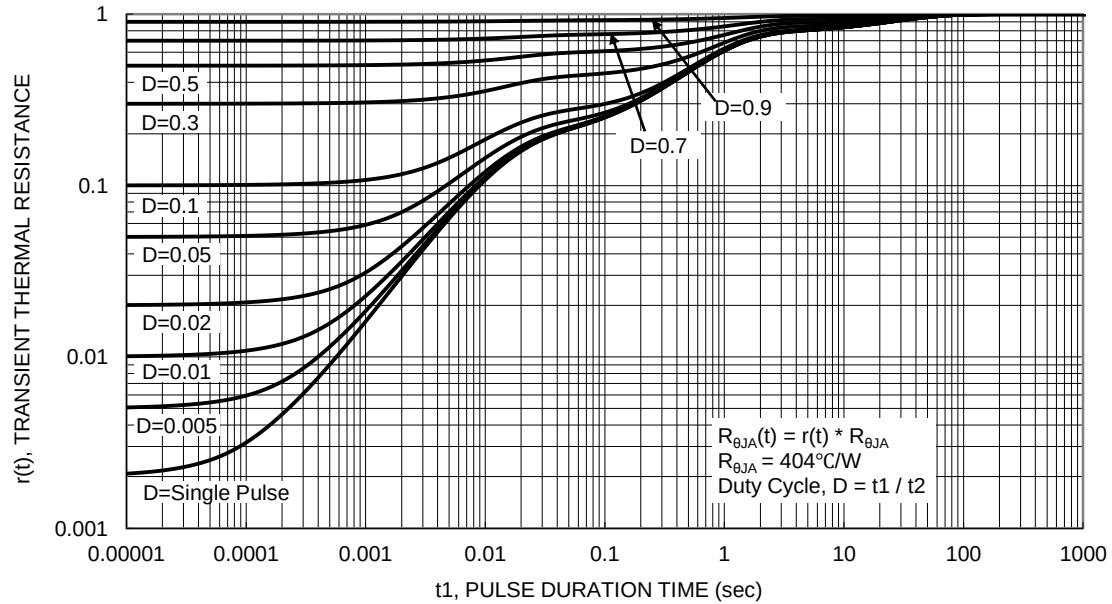
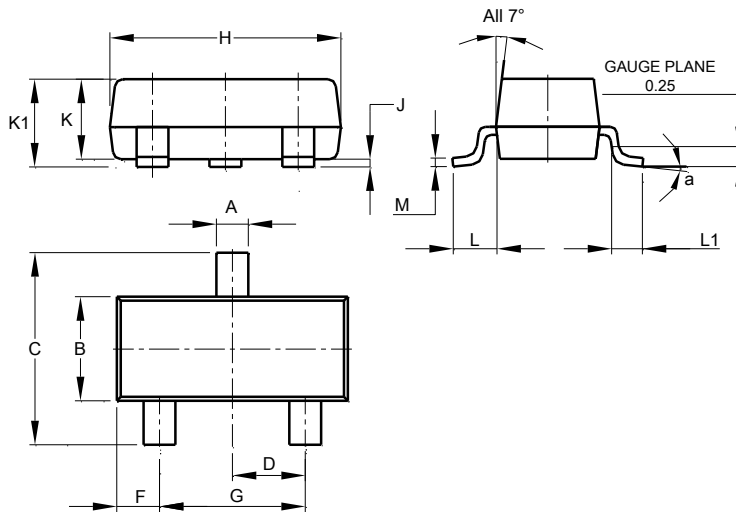


Figure 11. SOA, Safe Operation Area



## Package Outline Dimensions

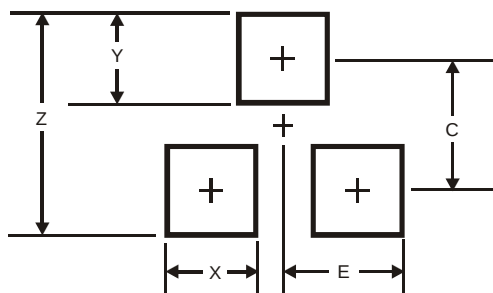
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| 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 |
| α                    | 8°    |       |       |
| All Dimensions in mm |       |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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

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