

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$                            | $I_D$<br>$T_A = +25^\circ\text{C}$ |
|---------------|-----------------------------------------|------------------------------------|
| -60V          | 250m $\Omega$ @ $V_{GS} = -10\text{V}$  | -2.1A                              |
|               | 300m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | -1.9A                              |

## Description

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

- Motor Control
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply

## Features and Benefits

- Low gate drive
- Low input capacitance
- Fast switching speed
- **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**

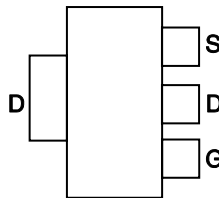
## Mechanical Data

- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame.  
Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.112 grams (approximate)

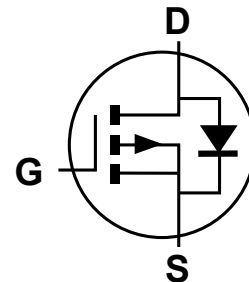
SOT223



Top View



Pin Out - Top View



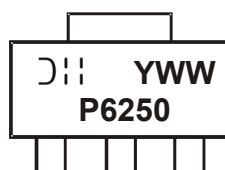
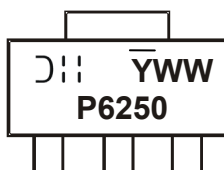
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number  | Qualification | Case   | Packaging           |
|--------------|---------------|--------|---------------------|
| DMP6250SE-13 | Standard      | SOT223 | 2,500 / Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. 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.
  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 <http://www.diodes.com/products/packages.html>.

## Marking Information



⌐⌐⌐ = Manufacturer's Marking

P6250 = Marking Code

YWW = Date Code Marking for SAT (Shanghai Assembly/ Test site)

YWW = Date Code Marking for CAT (Chengdu Assembly/ Test site)

Y or Y= Year (ex: 3 = 2013)

WW = Week (01 - 53)

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

| Characteristic                                           | Symbol                                           | Value        | Unit |
|----------------------------------------------------------|--------------------------------------------------|--------------|------|
| Drain-Source voltage                                     | V <sub>DSS</sub>                                 | -60          | V    |
| Gate-Source voltage (Note 5)                             | V <sub>GS</sub>                                  | ±20          | V    |
| Continuous Drain current (Note 6) V <sub>GS</sub> = -10V | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | -2.1<br>-1.7 | A    |
|                                                          | T <sub>C</sub> = +25°C<br>T <sub>C</sub> = +70°C | -6.1<br>-4.9 | A    |
| Maximum Body Diode Continuous Current                    | I <sub>S</sub>                                   | -1.8         | A    |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       | I <sub>DM</sub>                                  | -11          | A    |
| Single Pulsed Avalanche Current (Note 7) L = 0.1mH       | I <sub>AS</sub>                                  | -12          | A    |
| Single Pulsed Avalanche Energy (Note 7) L = 0.1mH        | E <sub>AS</sub>                                  | 8            | mJ   |

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

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.8         | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 1.1         |       |
| Thermal Resistance, Junction to Ambient (Note 6) |                        | R <sub>θJA</sub>                  | 69          | °C/W  |
| Total Power Dissipation (Note 6)                 | T <sub>C</sub> = +25°C | P <sub>D</sub>                    | 14          | W     |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 8.7         |       |
| 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                                                                                |
|-----------------------------------|----------------------|-----|------|------|------|-----------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 8)      |                      |     |      |      |      |                                                                                               |
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>    | -60 | —    | —    | V    | I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V                                                 |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub>     | —   | —    | -1   | μA   | V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V                                                  |
| Gate-Source Leakage               | I <sub>GSS</sub>     | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                                  |
| ON CHARACTERISTICS (Note 8)       |                      |     |      |      |      |                                                                                               |
| Gate Threshold Voltage            | V <sub>GS(th)</sub>  | -1  | —    | -3   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                   |
| Static Drain-Source On-Resistance | R <sub>DS (ON)</sub> | —   | —    | 250  | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -1.0A                                                |
|                                   |                      |     |      | 300  |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.5A                                               |
| Diode Forward Voltage             | V <sub>SD</sub>      | —   | —    | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2.0A                                                  |
| DYNAMIC CHARACTERISTICS (Note 9)  |                      |     |      |      |      |                                                                                               |
| Input Capacitance                 | C <sub>iSS</sub>     | —   | 551  | —    | pF   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V<br>f= 1MHz                                       |
| Output Capacitance                | C <sub>oSS</sub>     | —   | 25.7 | —    | pF   |                                                                                               |
| Reverse Transfer Capacitance      | C <sub>rSS</sub>     | —   | 19.1 | —    | pF   |                                                                                               |
| Gate Resistance                   | R <sub>g</sub>       | —   | 12.1 | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                          |
| Total Gate Charge (VGS = -4.5V)   | Q <sub>g</sub>       | —   | 4.8  | —    | nC   | V <sub>DS</sub> = -30V, I <sub>D</sub> = -2A                                                  |
| Total Gate Charge (VGS = -10V)    | Q <sub>g</sub>       | —   | 9.7  | —    | nC   |                                                                                               |
| Gate-Source Charge                | Q <sub>gs</sub>      | —   | 1.5  | —    | nC   |                                                                                               |
| Gate-Drain Charge                 | Q <sub>gd</sub>      | —   | 1.6  | —    | nC   |                                                                                               |
| Turn-On Delay Time                | t <sub>D(on)</sub>   | —   | 6.3  | —    | ns   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = -10V,<br>R <sub>G</sub> = 50Ω, I <sub>D</sub> = -1A |
| Turn-On Rise Time                 | t <sub>r</sub>       | —   | 10.3 | —    | ns   |                                                                                               |
| Turn-Off Delay Time               | t <sub>D(off)</sub>  | —   | 91.4 | —    | ns   |                                                                                               |
| Turn-Off Fall Time                | t <sub>f</sub>       | —   | 39.8 | —    | ns   |                                                                                               |
| Reverse recovery time             | t <sub>rr</sub>      | —   | 9.2  | —    | ns   | I <sub>S</sub> = -1A, di/dt= 100A/μs                                                          |
| Reverse recovery charge           | Q <sub>rr</sub>      | —   | 3.9  | —    | nC   |                                                                                               |

- Notes:
5. AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  7. IAR and EAR rating are based on low frequency and duty cycles to keep T<sub>J</sub> = 25°C
  8. Short duration pulse test used to minimize self-heating effect.
  9. For design aid only, not subject to production testing.

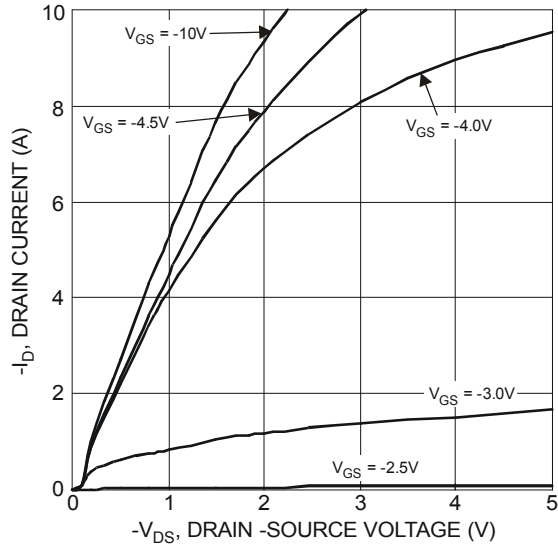


Figure 1 Typical Output Characteristics

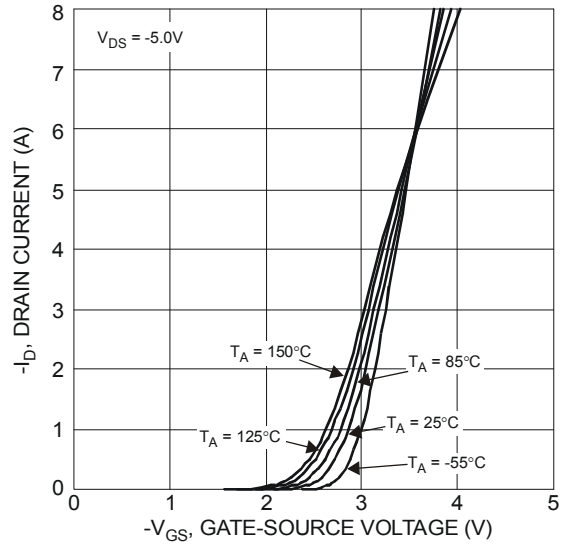


Figure 2 Typical Transfer Characteristics

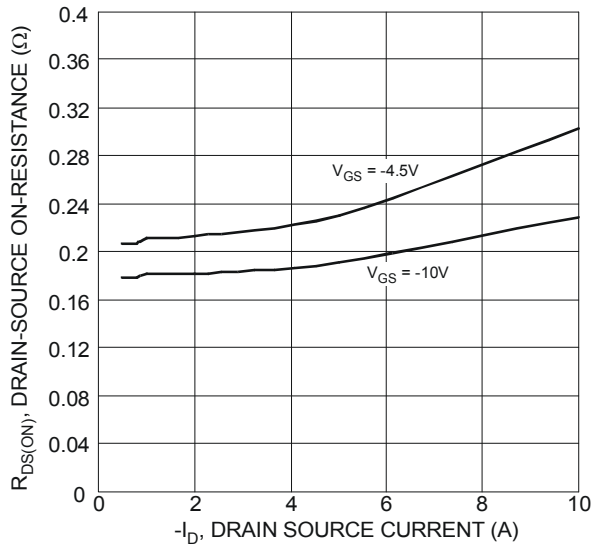


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

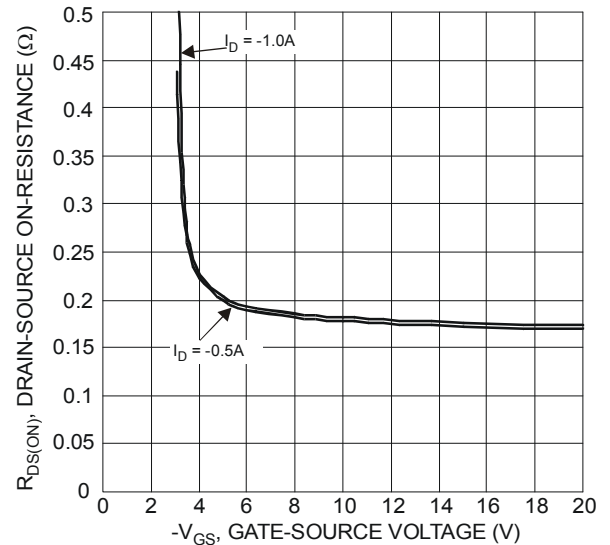


Figure 4 Typical Transfer Characteristics

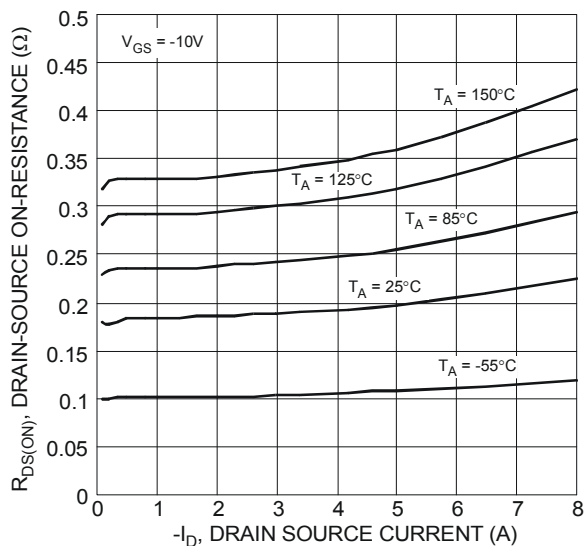


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

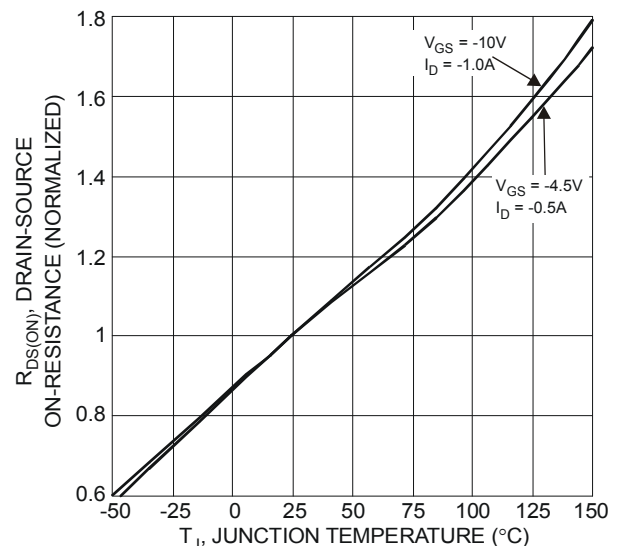


Figure 6 On-Resistance Variation with Temperature

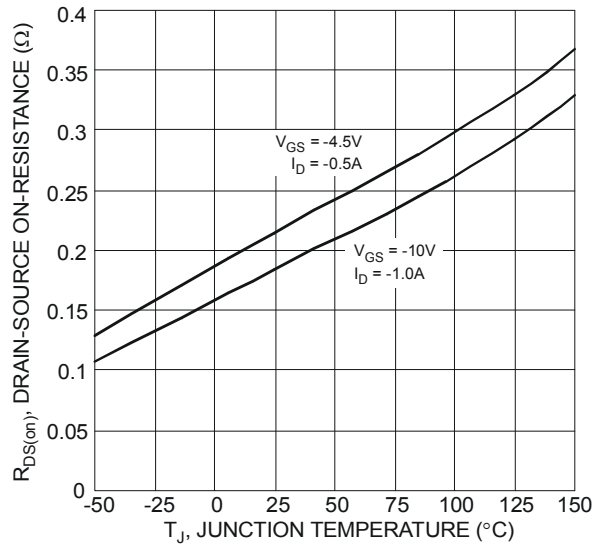


Figure 7 On-Resistance Variation with Temperature

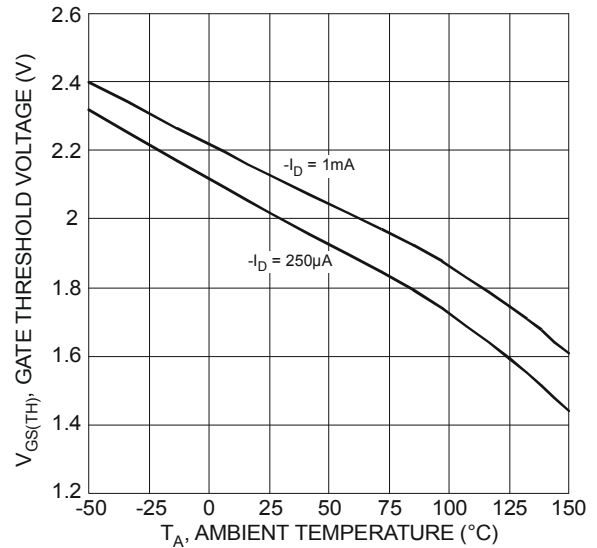


Figure 8 Gate Threshold Variation vs. Ambient Temperature

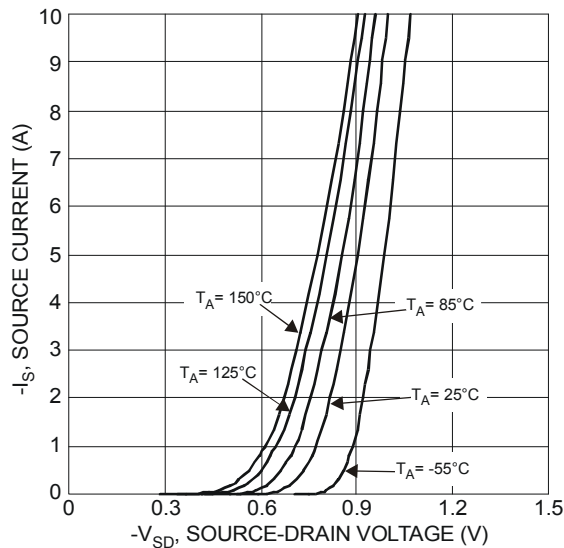


Figure 9 Diode Forward Voltage vs. Current

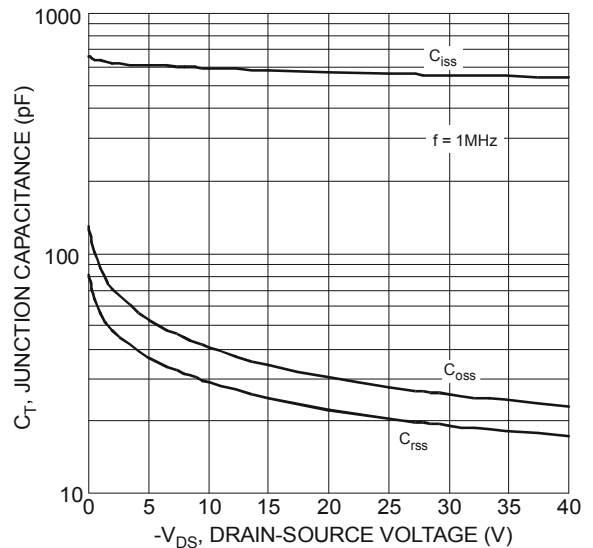


Figure 10 Typical Junction Capacitance

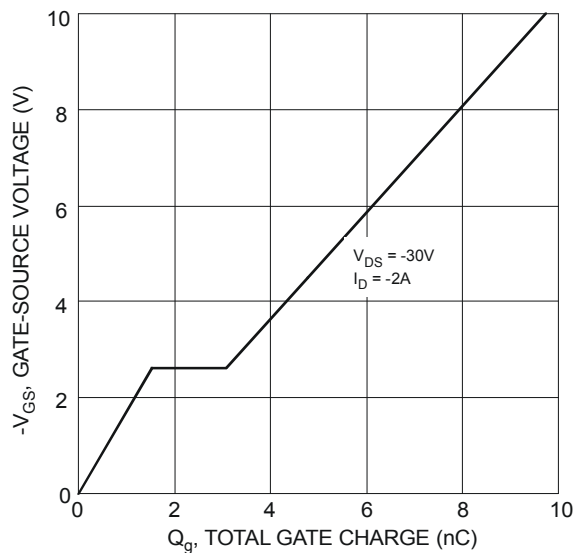


Figure 11 Gate-Charge Characteristics

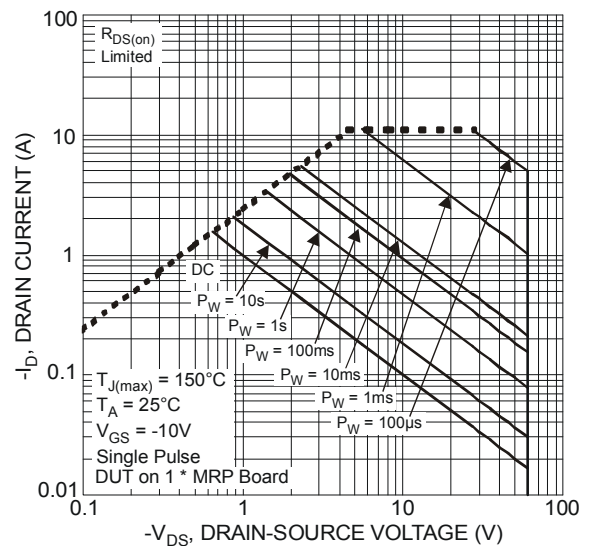
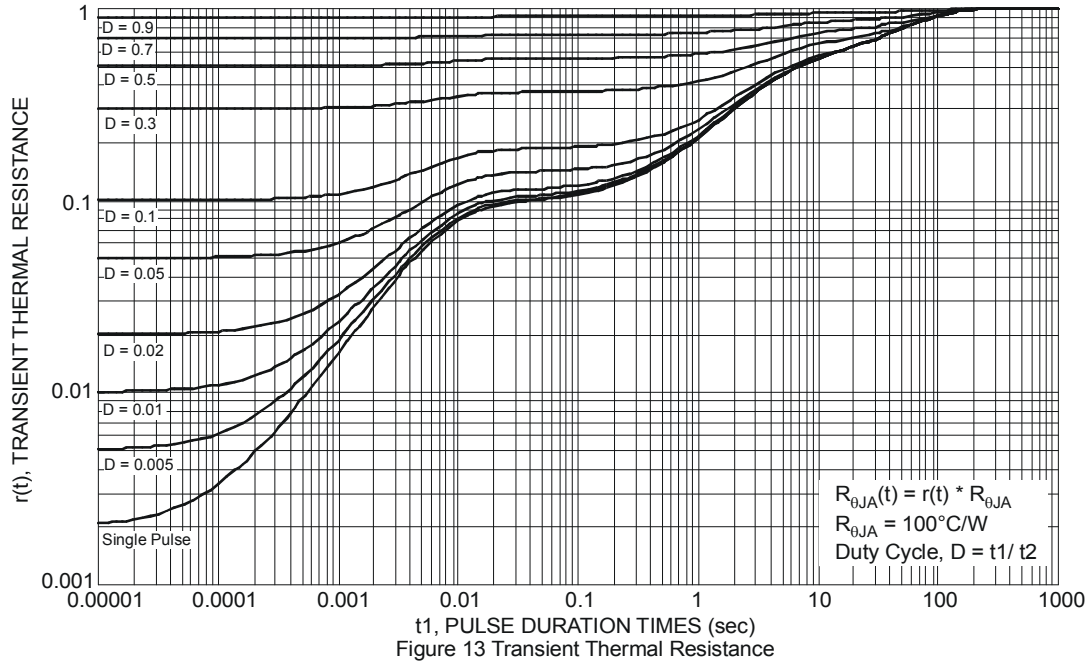
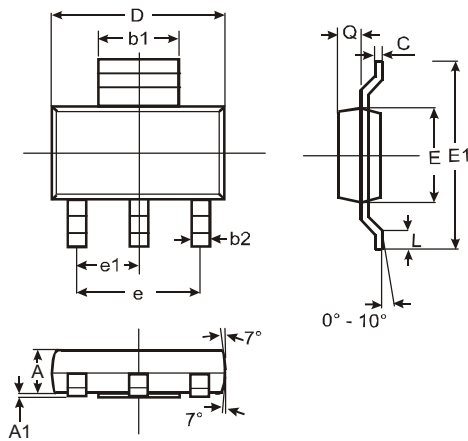


Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

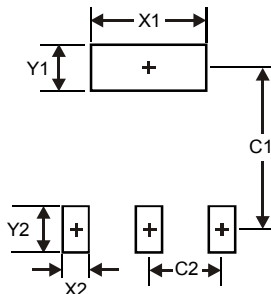
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b1                   | 2.90  | 3.10 | 3.00 |
| b2                   | 0.60  | 0.80 | 0.70 |
| C                    | 0.20  | 0.30 | 0.25 |
| D                    | 6.45  | 6.55 | 6.50 |
| E                    | 3.45  | 3.55 | 3.50 |
| E1                   | 6.90  | 7.10 | 7.00 |
| e                    | —     | —    | 4.60 |
| e1                   | —     | —    | 2.30 |
| L                    | 0.85  | 1.05 | 0.95 |
| Q                    | 0.84  | 0.94 | 0.89 |
| 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) |
|------------|---------------|
| X1         | 3.3           |
| X2         | 1.2           |
| Y1         | 1.6           |
| Y2         | 1.6           |
| C1         | 6.4           |
| C2         | 2.3           |

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