

## Product Summary

- Continuous Drain-Source Voltage:  $V_{DS} = 60V$
- On-State Resistance:  $550m\Omega$
- Nominal Load Current ( $V_{IN} = 5V$ ): 1.4A
- Clamping Energy: 550mJ

## Description

The BSP75G-13 is a self-protected low-side IntelliFET® MOSFET. It features monolithic overtemperature, overcurrent, overvoltage (active clamp) and ESD protected logic-level functionality. It is intended as a general-purpose switch.

## Applications

- Especially suited for loads with a high inrush current such as lamps and motors
- All types of resistive, inductive and capacitive loads in switching applications
- $\mu C$  compatible power switches for 12V and 24V DC applications
- Replaces electromechanical relays and discrete circuits
- Linear mode capabilities - the current-limiting protection circuitry is designed to de-activate at low  $V_{DS}$  in order not to compromise the load current during normal operation. The maximum DC operating current is therefore determined by the thermal capability of the package/board combination, rather than by the protection circuitry.

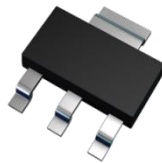
## Features and Benefits

- Short-Circuit Protection with Auto Restart
- Overvoltage Protection (Active Clamp)
- Thermal Shutdown with Auto Restart
- Overcurrent Protection
- Input Protection (ESD)
- Load Dump Protection (Actively Protects Load)
- Logic-Level Input
- High Continuous Current Rating
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact_us) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

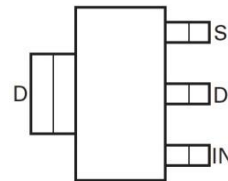
## Mechanical Data

- Package: SOT223
- Package Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish (E3)
- Weight: 0.112 grams (Approximate)

SOT223



Top View



Top View  
Pin Out

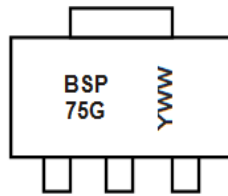
Note: The tab is connected to the drain pin, and must be electrically isolated from the source pin. Connection of significant copper to the tab is recommended for best thermal performance.

## Ordering Information (Note 4)

| Part Number | Package | Marking | Reel Size (inches) | Tape Width (mm) | Packing     |         |
|-------------|---------|---------|--------------------|-----------------|-------------|---------|
|             |         |         |                    |                 | Qty.        | Carrier |
| BSP75G-13   | SOT223  | BSP75G  | 13                 | 12              | 4,000 Units | Reel    |

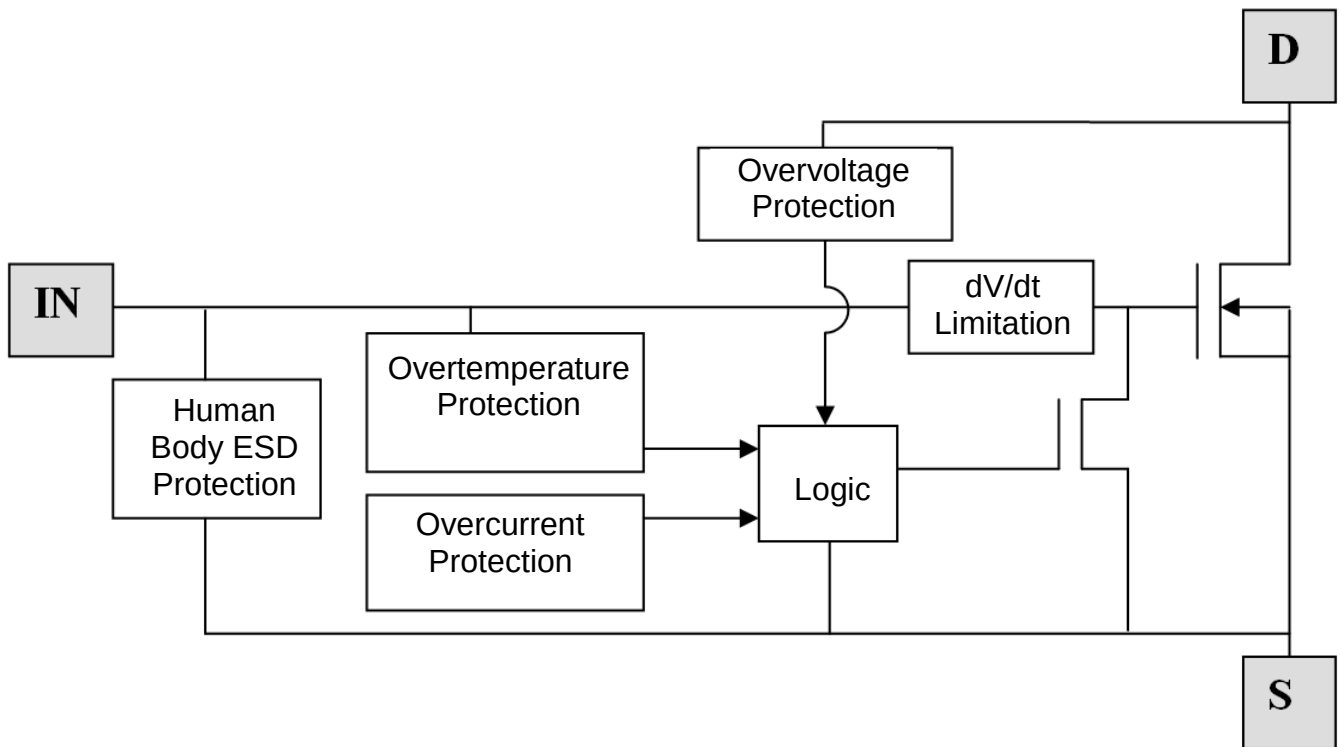
- Notes:
- EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



BSP75G = Product Type Marking Code  
YWW = Date Code Marking  
Y or  $\bar{Y}$  = Last Digit of Year (ex: 4 = 2024)  
WW or  $\bar{WW}$  = Week Code (01 to 53)

## Functional Block Diagram



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

| Parameter                                                                         | Symbol                 | Value       | Unit |
|-----------------------------------------------------------------------------------|------------------------|-------------|------|
| Continuous Drain-Source Voltage                                                   | V <sub>DS</sub>        | 60          | V    |
| Drain-Source Voltage for Short-Circuit Protection, V <sub>IN</sub> = 5V           | V <sub>DS(SC)</sub>    | 36          | V    |
| Continuous Input Voltage                                                          | V <sub>IN</sub>        | -0.2 to +10 | V    |
| Peak Input Voltage                                                                | V <sub>IN</sub>        | -0.2 to +20 | V    |
| Operating Temperature Range                                                       | T <sub>J</sub>         | -40 to +150 | °C   |
| Storage Temperature Range                                                         | T <sub>STG</sub>       | -55 to +150 | °C   |
| Power Dissipation at T <sub>A</sub> = +25°C (Note 5)                              | P <sub>D</sub>         | 2.5         | W    |
| Continuous Drain Current @ V <sub>IN</sub> = 10V; T <sub>A</sub> = +25°C (Note 5) | I <sub>D</sub>         | 1.6         | A    |
| Continuous Drain Current @ V <sub>IN</sub> = 5V; T <sub>A</sub> = +25°C (Note 5)  | I <sub>D</sub>         | 1.4         | A    |
| Pulsed Drain Current @ V <sub>IN</sub> = 10V                                      | I <sub>DM</sub>        | 5           | A    |
| Continuous Source Current (Body Diode) (Note 5)                                   | I <sub>S</sub>         | 3           | A    |
| Pulsed Source Current (Body Diode)                                                | I <sub>S</sub>         | 5           | A    |
| Unclamped Single Pulse Inductive Energy                                           | E <sub>AS</sub>        | 550         | mJ   |
| Load Dump Protection                                                              | V <sub>LOAD_DUMP</sub> | 80          | V    |
| Electrostatic Discharge (Human Body Model)                                        | V <sub>ESD</sub>       | 4000        | V    |
| DIN Humidity Category, DIN 40 040                                                 | —                      | E           | —    |
| IEC Climatic Category, DIN IEC 68-1                                               | —                      | 40/150/56   | —    |

## Thermal Resistance

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Junction to Ambient (Note 5) | R <sub>θJA</sub> | 50    | °C/W |
| Junction to Ambient (Note 6) | R <sub>θJA</sub> | 24    | °C/W |
| Junction to Ambient (Note 7) | R <sub>θJA</sub> | 208   | °C/W |

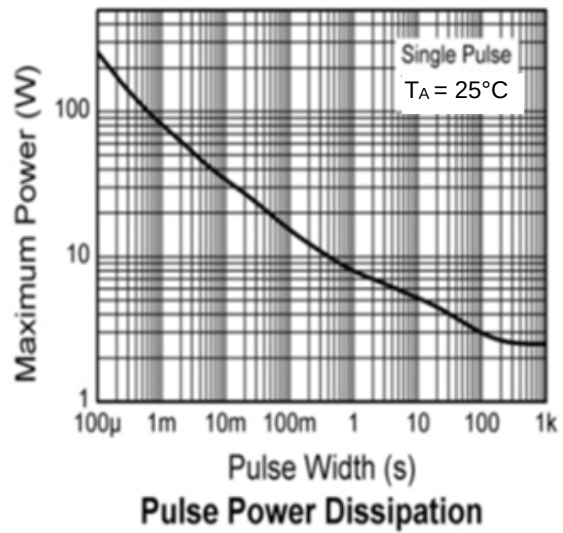
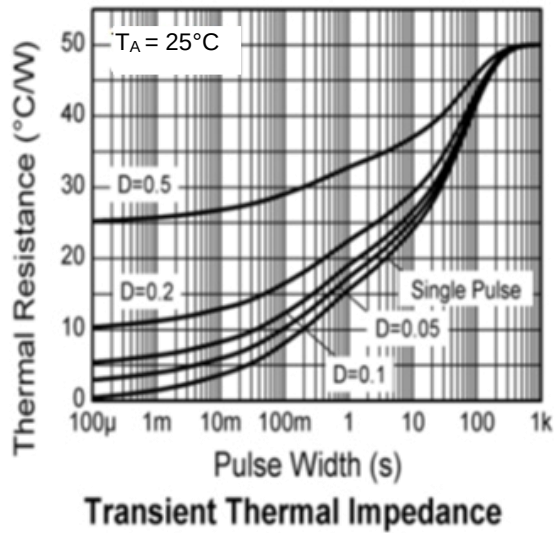
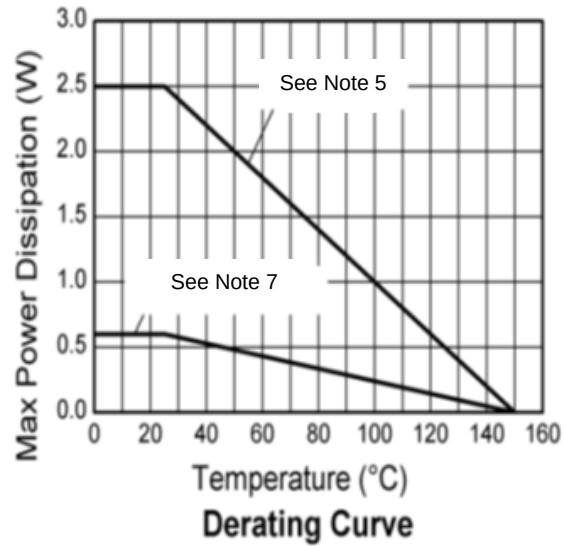
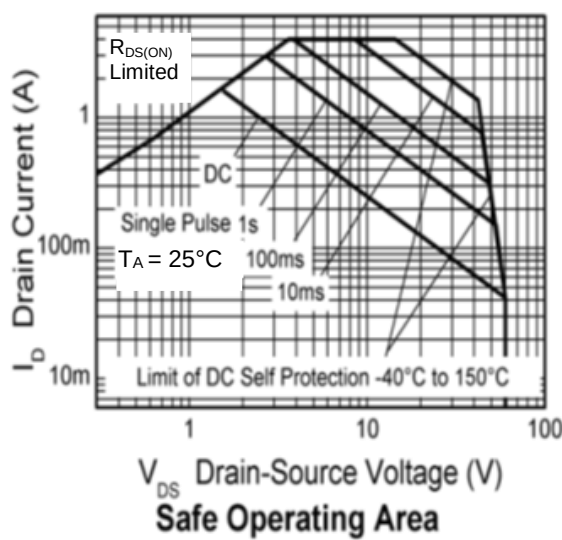
Notes: 5. For a device surface-mounted on 37mm x 37mm x 1.6mm FR-4 board with a high coverage of single sided 2oz weight copper.  
6. For a device surface-mounted on FR-4 board and measured at t ≤ 10s.  
7. For a device mounted on FR-4 board with the minimum copper required for electrical connections.

## Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise stated.)

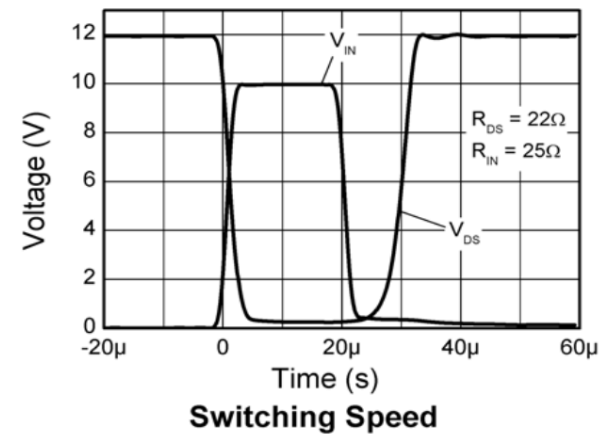
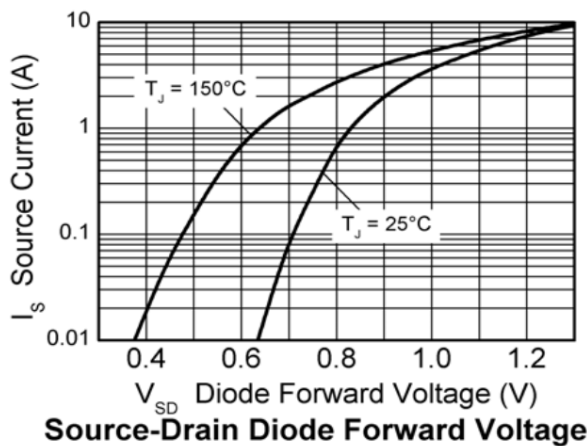
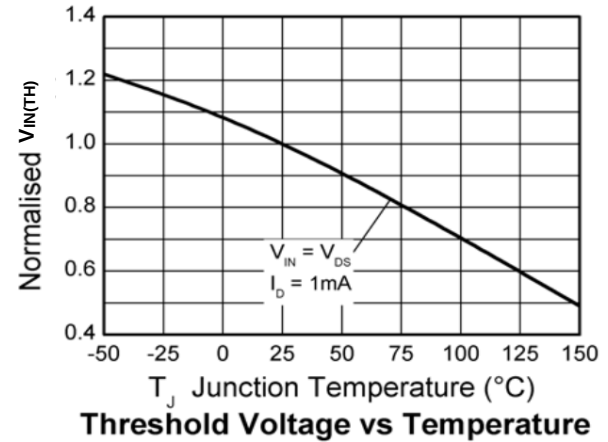
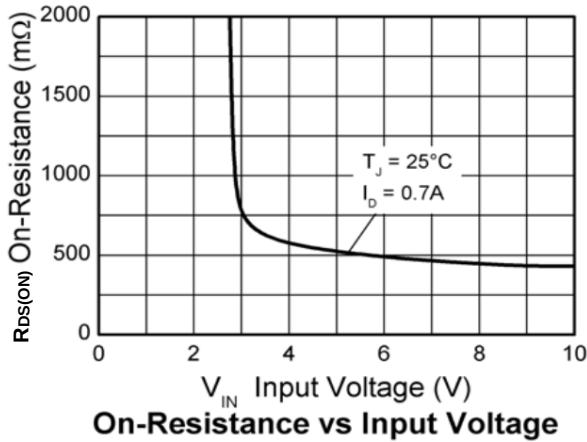
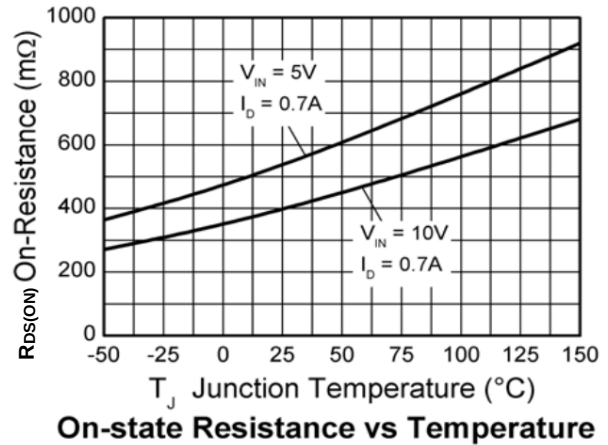
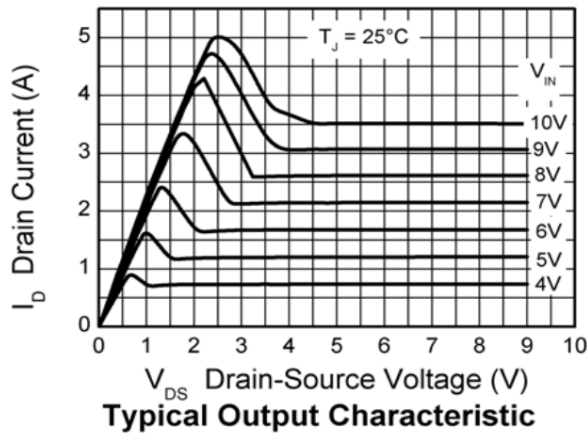
| Parameter                                                       | Symbol                              | Min  | Typ  | Max  | Unit | Conditions                                                               |
|-----------------------------------------------------------------|-------------------------------------|------|------|------|------|--------------------------------------------------------------------------|
| <b>Static Characteristics</b>                                   |                                     |      |      |      |      |                                                                          |
| Drain-Source Clamp Voltage                                      | V <sub>DS(AZ)</sub>                 | 60   | 70   | 75   | V    | I <sub>D</sub> = 10mA                                                    |
| Off-State Drain Current                                         | I <sub>DSS</sub>                    | —    | 0.1  | 3    | μA   | V <sub>DS</sub> = 12V, V <sub>IN</sub> = 0V                              |
| Off-State Drain Current                                         | I <sub>DSS</sub>                    | —    | 3    | 15   | μA   | V <sub>DS</sub> = 32V, V <sub>IN</sub> = 0V                              |
| Input Threshold Voltage (Note 8)                                | V <sub>IN(TH)</sub>                 | 1    | 2.1  | —    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1mA                 |
| Input Current                                                   | I <sub>IN</sub>                     | —    | 0.7  | 1.2  | mA   | V <sub>IN</sub> = 5V                                                     |
| Input Current                                                   | I <sub>IN</sub>                     | —    | 1.5  | 2.7  | mA   | V <sub>IN</sub> = 7V                                                     |
| Input Current                                                   | I <sub>IN</sub>                     | —    | 4    | 7    | mA   | V <sub>IN</sub> = 10V                                                    |
| Static Drain-Source On-State Resistance                         | R <sub>DS(ON)</sub>                 | —    | 520  | 675  | mΩ   | V <sub>IN</sub> = 5V, I <sub>D</sub> = 0.7A                              |
| Static Drain-Source On-State Resistance                         | R <sub>DS(ON)</sub>                 | —    | 385  | 550  | mΩ   | V <sub>IN</sub> = 10V, I <sub>D</sub> = 0.7A                             |
| Current Limit (Note 9)                                          | I <sub>D(LIM)</sub>                 | 0.7  | 1.1  | 1.75 | A    | V <sub>IN</sub> = 5V, V <sub>DS</sub> > 5V                               |
| Current Limit (Note 9)                                          | I <sub>D(LIM)</sub>                 | 2    | 3    | 4    | A    | V <sub>IN</sub> = 10V, V <sub>DS</sub> > 5V                              |
| <b>Dynamic Characteristics</b>                                  |                                     |      |      |      |      |                                                                          |
| Turn-On Time (V <sub>IN</sub> to 90% I <sub>D</sub> )           | t <sub>ON</sub>                     | —    | 2.2  | —    | μs   | R <sub>L</sub> = 22Ω, V <sub>IN</sub> = 0 to 10V, V <sub>DD</sub> = 12V  |
| Turn-Off Time (V <sub>IN</sub> to 90% I <sub>D</sub> )          | t <sub>OFF</sub>                    | —    | 13   | —    | μs   | R <sub>L</sub> = 22Ω, V <sub>IN</sub> = 10V to 0V, V <sub>DD</sub> = 12V |
| Slew Rate On (70 to 50% V <sub>DD</sub> )                       | -dV <sub>DS</sub> /dt <sub>ON</sub> | —    | 10   | —    | V/μs | R <sub>L</sub> = 22Ω, V <sub>IN</sub> = 0 to 10V, V <sub>DD</sub> = 12V  |
| Slew Rate Off (50 to 70% V <sub>DD</sub> )                      | dV <sub>DS</sub> /dt <sub>ON</sub>  | —    | 3.2  | —    | V/μs | R <sub>L</sub> = 22Ω, V <sub>IN</sub> = 10V to 0V, V <sub>DD</sub> = 12V |
| <b>Protection Functions (Note 10)</b>                           |                                     |      |      |      |      |                                                                          |
| Minimum Input Voltage for Overtemperature Protection            | V <sub>PROT</sub>                   | 4.5  | —    | —    | V    | —                                                                        |
| Thermal Overload Trip Temperature                               | T <sub>JT</sub>                     | +150 | +175 | —    | °C   | —                                                                        |
| Thermal Hysteresis                                              | —                                   | —    | +10  | —    | °C   | —                                                                        |
| Unclamped Single Pulse Inductive Energy T <sub>J</sub> = +25°C  | E <sub>AS</sub>                     | 550  | —    | —    | mJ   | I <sub>D(ISO)</sub> = 0.7A, V <sub>DD</sub> = 32V                        |
| Unclamped Single Pulse Inductive Energy T <sub>J</sub> = +150°C | E <sub>AS</sub>                     | 200  | —    | —    | mJ   | I <sub>D(ISO)</sub> = 0.7A, V <sub>DD</sub> = 32V                        |
| <b>Inverse Diode</b>                                            |                                     |      |      |      |      |                                                                          |
| Source-Drain Voltage                                            | V <sub>SD</sub>                     | —    | —    | 1    | V    | V <sub>IN</sub> = 0V, -I <sub>D</sub> = 1.4A                             |

- Notes:
- Protection features may operate outside spec for V<sub>IN</sub> < 4.5V.
  - The drain current is limited to a reduced value when V<sub>DS</sub> exceeds a safe level.
  - Integrated protection functions are designed to prevent IC destruction under fault conditions described in the datasheet. Fault conditions are considered as "outside" normal operating range. Protection functions are not designed for continuous, repetitive operation.

## Typical Characteristics



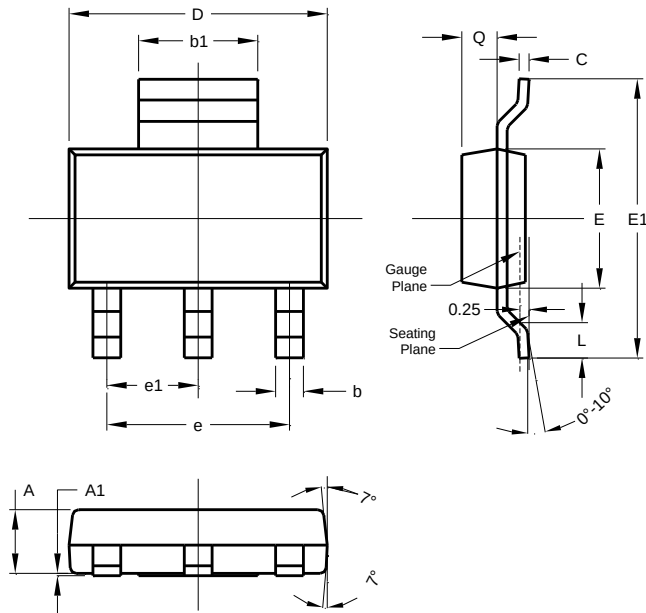
**Typical Characteristics** (continued)



## Package Outline Dimensions

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

**SOT223**

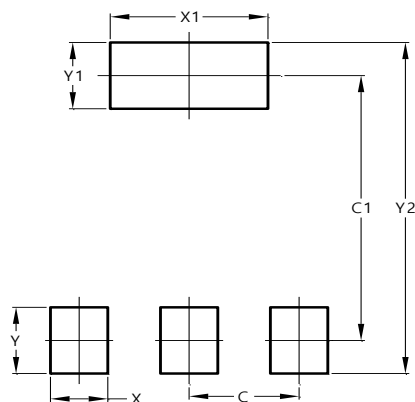


| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b                    | 0.60  | 0.80 | 0.70 |
| b1                   | 2.90  | 3.10 | 3.00 |
| 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 <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT223**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.30          |
| C1         | 6.40          |
| X          | 1.20          |
| X1         | 3.30          |
| Y          | 1.60          |
| Y1         | 1.60          |
| Y2         | 8.00          |

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