

## Product Summary

| $BV_{DSS}$ | $R_{DS(on)}$                     | $I_D$<br>$T_A = +25^\circ C$ |
|------------|----------------------------------|------------------------------|
| -60V       | 150m $\Omega$ @ $V_{GS} = -10V$  | -3A                          |
|            | 185m $\Omega$ @ $V_{GS} = -4.5V$ | -2.7A                        |

## Description and Applications

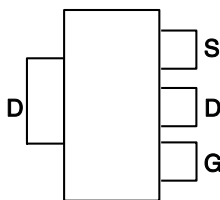
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply

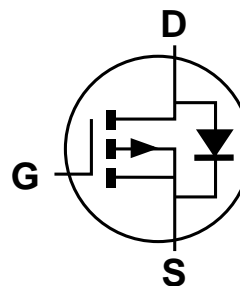
SOT223



Top View



Pin Out - Top



Equivalent Circuit

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **Lead-Free Finish; 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)**

## Mechanical Data

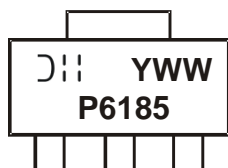
- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin Annealed over Copper Leadframe.  
Solderable per MIL-STD-202, Method 208 **e3**
- Weight: 0.112 grams (Approximate)

## Ordering Information (Note 5)

| Part Number   | Case   | Packaging           |
|---------------|--------|---------------------|
| DMP6185SEQ-13 | SOT223 | 2,500 / Tape & Reel |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



D = Manufacturer's Marking  
 P6185 = Marking Code  
 YWW or YWW = Date Code Marking  
 Y or Y = Year (ex: 7 = 2017)  
 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                                      |                        | V <sub>GS</sub>  | ±20   | V    |
| Continuous Drain current (Note 7) V <sub>GS</sub> = -10V | T <sub>A</sub> = +25°C | I <sub>D</sub>   | -3    | A    |
|  | T <sub>A</sub> = +70°C |                  | -2.4  |      |
| Maximum Body Diode Continuous Current                    |                        | I <sub>S</sub>   | -2    | A    |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |                        | I <sub>DM</sub>  | -15   | A    |
| Single Pulsed Avalanche Current (Note 8)                 |                        | I <sub>AS</sub>  | -16   | A    |
| Single Pulsed Avalanche Energy (Note 8)                  |                        | E <sub>AS</sub>  | 13    | 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>                    | 1.2         | W     |
|  | T <sub>A</sub> = +70°C |                                   | 0.8         |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 104         | °C/W  |
|  | t<10s                  |                                   | 51          |       |
| Total Power Dissipation (Note 7)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 2.2         | W     |
|  | T <sub>A</sub> = +70°C |                                   | 1.4         |       |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady state           | R <sub>θJA</sub>                  | 60          | °C/W  |
|  | t<10s                  |                                   | 30          |       |
| Thermal Resistance, Junction to Case (Note 7)    |                        | R <sub>θJC</sub>                  | 7.6         |       |
| 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</b> (Note 9)         |                     |     |       |       |      |  |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | -60 | —     | —     | 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> = -48V, 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</b> (Note 9)          |                     |     |       |       |      |  |
| 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> | —   | 110   | 150   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -2.2A   |
|   |                     |     | 130   | 185   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -1.8A  |
| Diode Forward Voltage                       | V <sub>SD</sub>     | —   | -0.75 | -0.95 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A   |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10)    |                     |     |       |       |      |  |
| Input Capacitance                           | C <sub>iss</sub>    | —   | 708   | —     | pF   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V, f = 1MHz                                       |
| Output Capacitance                          | C <sub>oss</sub>    | —   | 39    | —     | pF   |  |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —   | 32    | —     | pF   |  |
| Gate Resistance                             | R <sub>g</sub>      | —   | 17    | 28    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz   |
| Total Gate Charge (V <sub>GS</sub> = -4.5V) | Q <sub>g</sub>      | —   | 6.2   | —     | nC   | V <sub>DS</sub> = -30V, I <sub>D</sub> = -12A  |
| Total Gate Charge (V <sub>GS</sub> = -10V)  | Q <sub>g</sub>      | —   | 14    | —     | nC   |  |
| Gate-Source Charge                          | Q <sub>gs</sub>     | —   | 2.8   | —     | nC   |  |
| Gate-Drain Charge                           | Q <sub>gd</sub>     | —   | 3.1   | —     | nC   |  |
| Turn-On Delay Time                          | t <sub>D(on)</sub>  | —   | 5.2   | —     | ns   | V <sub>DS</sub> = -30V, R <sub>L</sub> = 2.5Ω<br>V <sub>GS</sub> = -10V, R <sub>G</sub> = 3Ω |
| Turn-On Rise Time                           | t <sub>r</sub>      | —   | 23    | —     | ns   |  |
| Turn-Off Delay Time                         | t <sub>D(off)</sub> | —   | 33    | —     | ns   |  |
| Turn-Off Fall Time                          | t <sub>f</sub>      | —   | 39    | —     | ns   |  |
| Body Diode Reverse Recovery Time            | t <sub>rr</sub>     | —   | 22    | —     | ns   | I <sub>F</sub> = -12A, di/dt = 100A/µs   |
| Body Diode Reverse Recovery Charge          | Q <sub>rr</sub>     | —   | 17    | —     | nC   |  |

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  8. UIS in production with L = 0.1mH, starting T<sub>A</sub> = +25°C.
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to product testing.

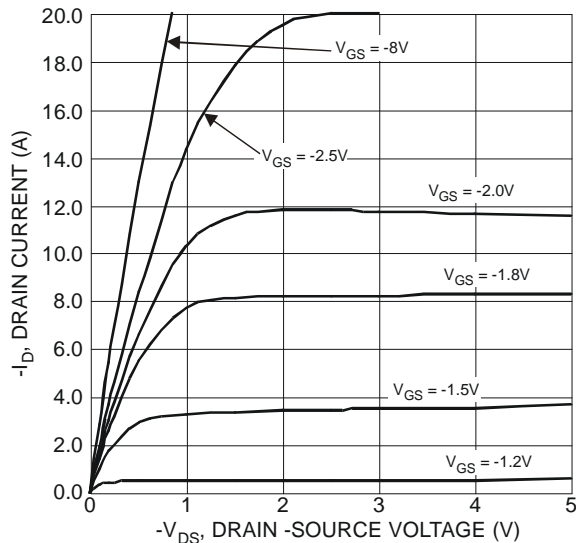


Figure 1 Typical Output Characteristics

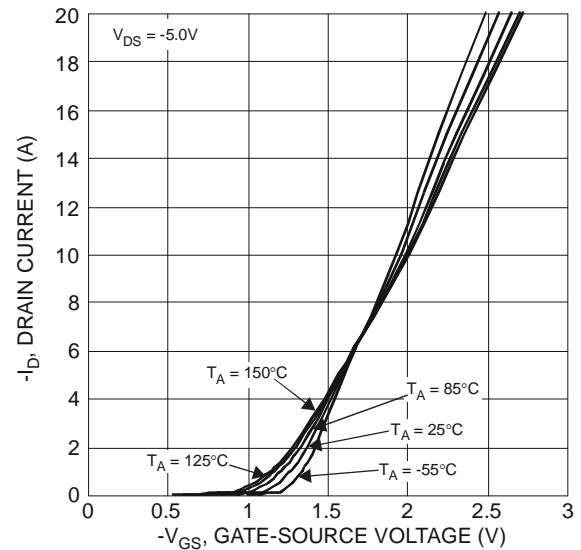


Figure 2 Typical Transfer Characteristics

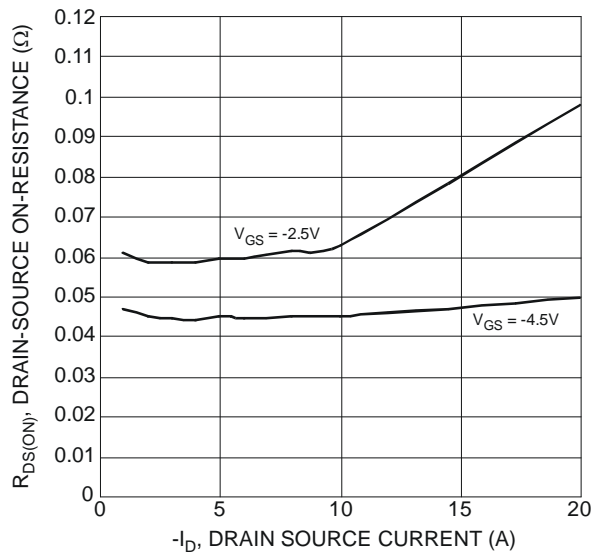


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

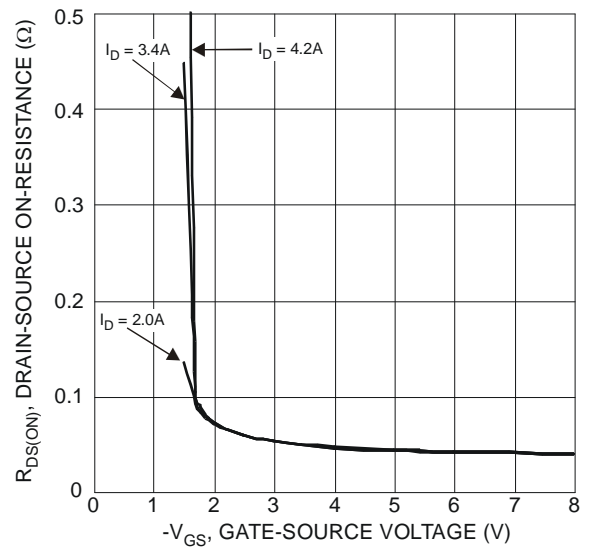


Figure 4 Typical Transfer Characteristics

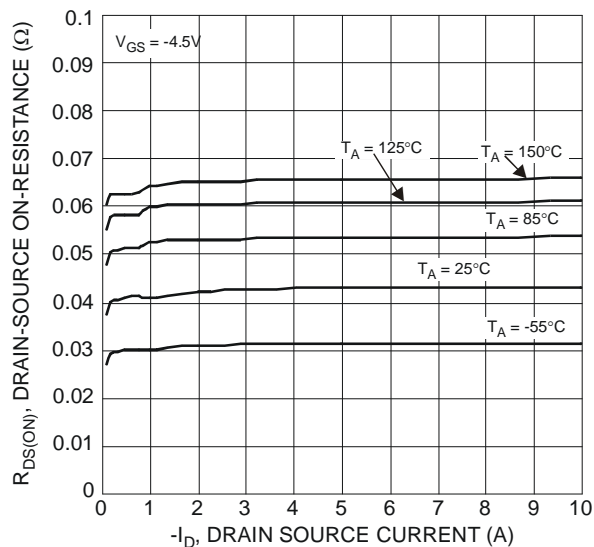


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

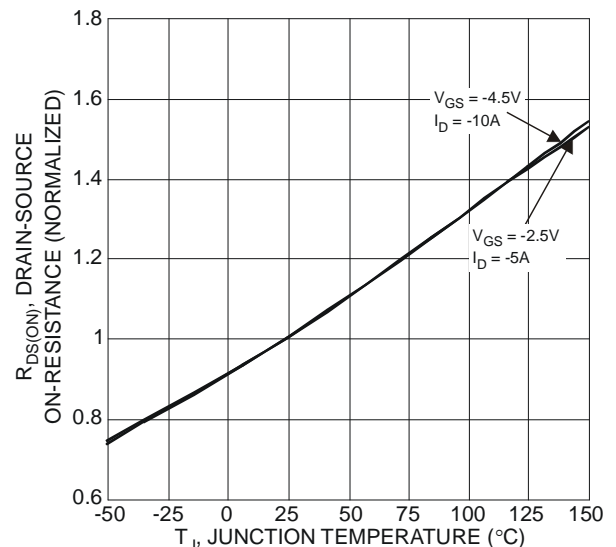


Figure 6 On-Resistance Variation with Temperature

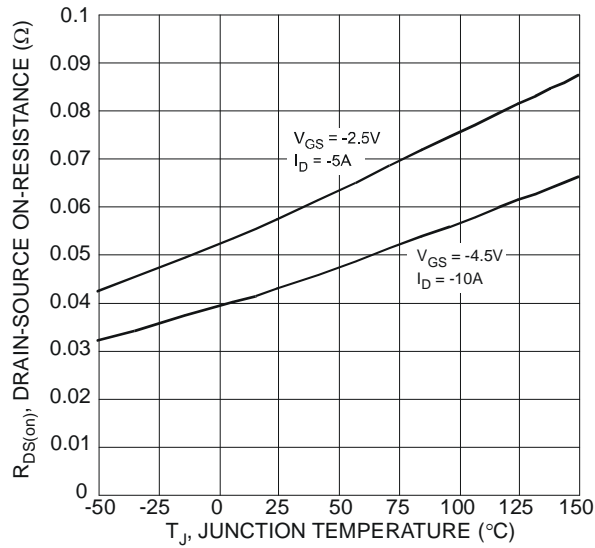


Figure 7 On-Resistance Variation with Temperature

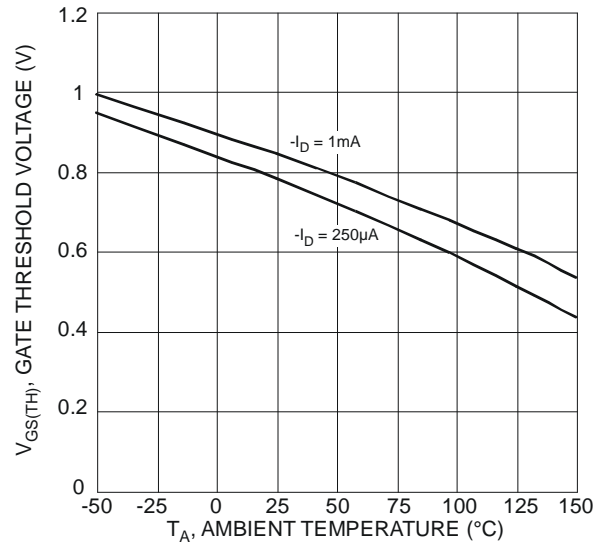


Figure 8 Gate Threshold Variation vs. Ambient Temperature

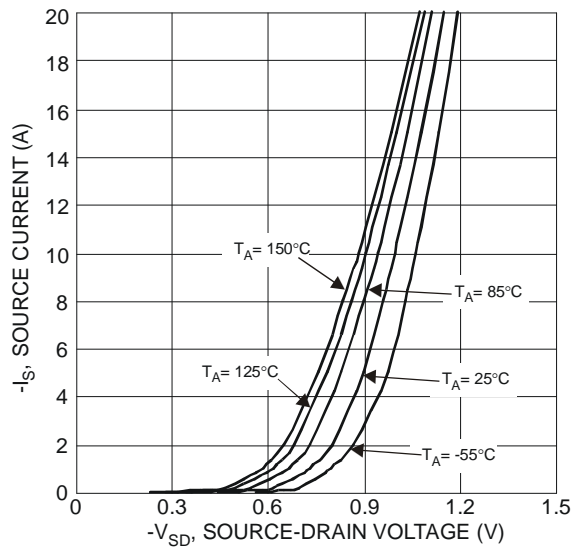


Figure 9 Diode Forward Voltage vs. Current

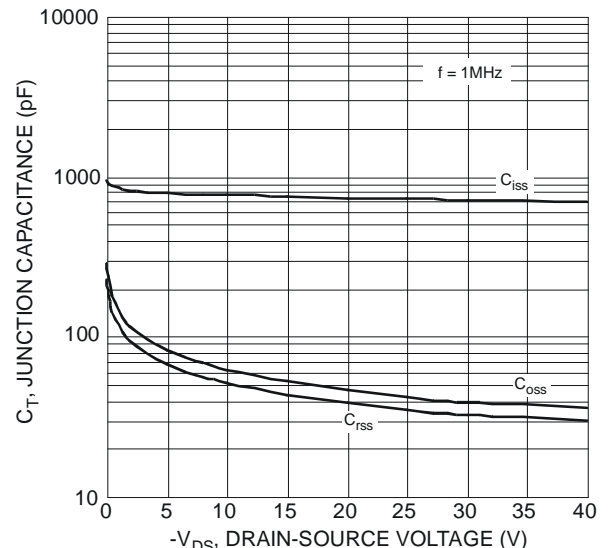


Figure 10 Typical Junction Capacitance

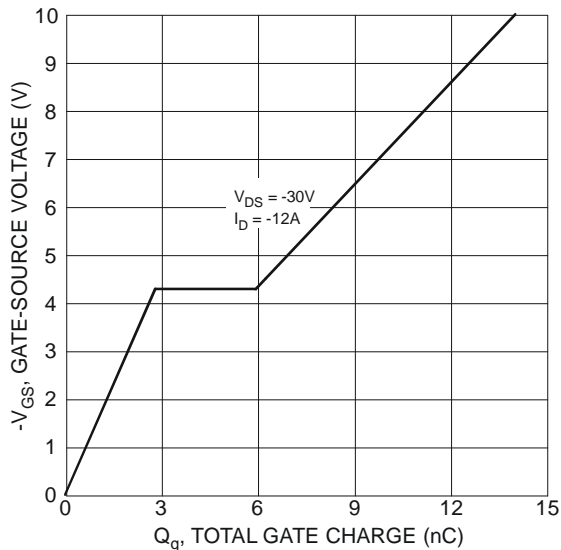
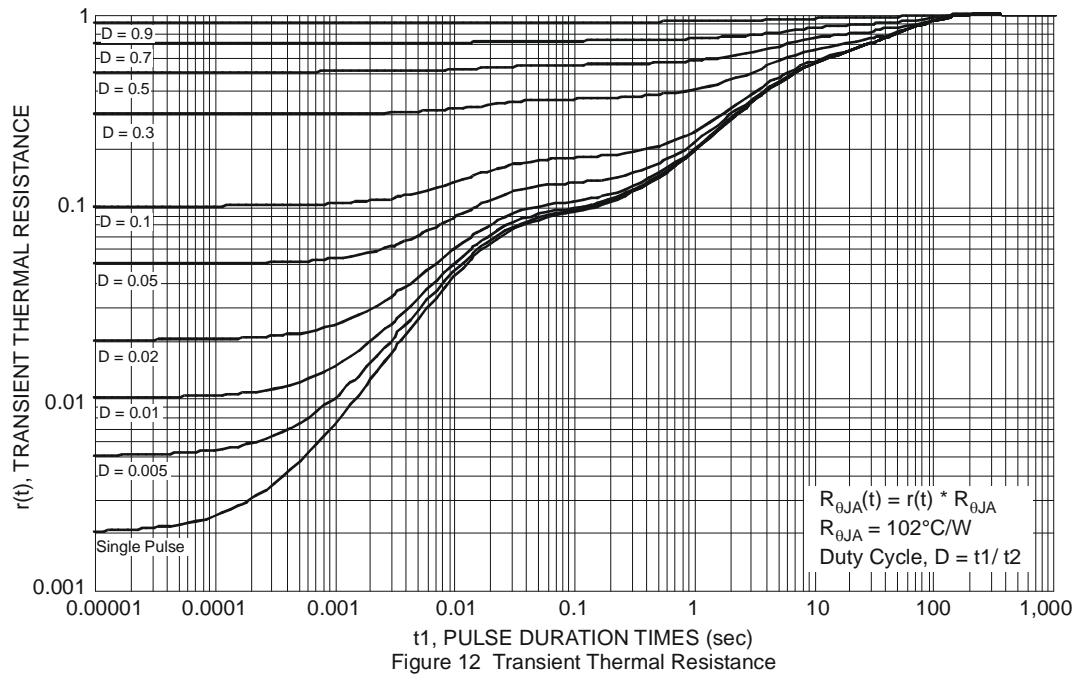
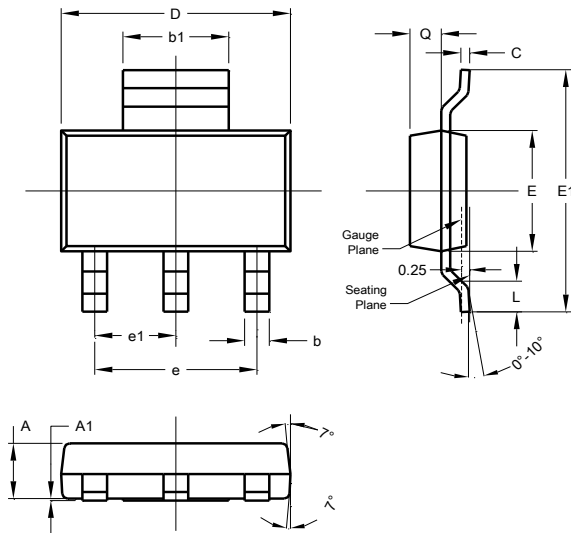


Figure 11 Gate-Charge Characteristics



## Package Outline Dimensions

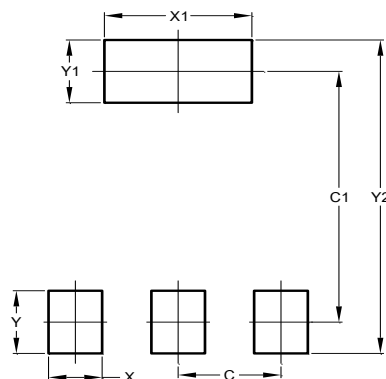
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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



| 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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