

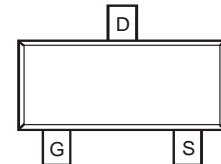
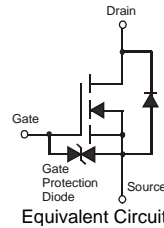
## Features

- N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- ESD Protected Gate, 1.2kV HBM
- **Lead, Halogen and Antimony Free, RoHS Compliant "Green" Device (Notes 2 and 4)**
- **Qualified to AEC-Q101 Standards for High Reliability**



TOP VIEW

SOT-23



TOP VIEW

## Mechanical Data

- Case: SOT-23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Copper leadframe).
- Terminal Connections: See Diagram
- Marking Information: See Page 3
- Ordering Information: See Page 3
- Weight: 0.008 grams (approximate)

## Maximum Ratings @<sub>T<sub>A</sub></sub> = 25°C unless otherwise specified

| Characteristic               | Symbol           | Value              | Units |
|------------------------------|------------------|--------------------|-------|
| Drain-Source Voltage         | V <sub>DSS</sub> | 60                 | V     |
| Gate-Source Voltage (Note 1) | V <sub>GSS</sub> | ±20                | V     |
| Drain Current (Note 1)       | I <sub>D</sub>   | Continuous         | 115   |
|                              |                  | Continuous @ 100°C | 73    |
|                              |                  | Pulsed             | 800   |

## Thermal Characteristics @<sub>T<sub>A</sub></sub> = 25°C unless otherwise specified

| Characteristic                                | Symbol                            | Value       | Units |
|---|-----------------------------------|-------------|-------|
| Total Power Dissipation                       | P <sub>D</sub>                    | 250         | mW    |
| Derating above T <sub>A</sub> = 25°C (Note 1) |                                   | 1.6         | mW/°C |
| Thermal Resistance, Junction to Ambient       | R <sub>θJA</sub>                  | 500         | °C/W  |
| Operating and Storage Temperature Range       | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

## Electrical Characteristics @<sub>T<sub>A</sub></sub> = 25°C unless otherwise specified

| Characteristic                      | Symbol              | Min                      | Typ | Max | Unit | Test Condition  |
|-------------------------------------|---------------------|--------------------------|-----|-----|------|---|
| <b>OFF CHARACTERISTICS (Note 3)</b> |                     |                          |     |     |      |   |
| Drain-Source Breakdown Voltage      | BV <sub>DSS</sub>   | 60                       | 70  | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA   |
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>    | @ T <sub>C</sub> = 25°C  | —   | 1.0 | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V   |
|                                     |                     | @ T <sub>C</sub> = 125°C | —   | 500 |      |   |
| Gate-Body Leakage                   | I <sub>GSS</sub>    | —                        | —   | ±10 | μA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 3)</b>  |                     |                          |     |     |      |   |
| Gate Threshold Voltage              | V <sub>GS(th)</sub> | 1.2                      | —   | 2.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA  |
| Static Drain-Source On-Resistance   | R <sub>DS(ON)</sub> | @ T <sub>J</sub> = 25°C  | —   | 3.5 | Ω    | V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 0.115A   |
|                                     |                     | @ T <sub>J</sub> = 125°C | —   | 3.0 | 5    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.115A  |
| Forward Transconductance            | g <sub>FS</sub>     | 80                       | —   | —   | mS   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.115A  |
| <b>DYNAMIC CHARACTERISTICS</b>      |                     |                          |     |     |      |   |
| Input Capacitance                   | C <sub>iSS</sub>    | —                        | 23  | —   | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz   |
| Output Capacitance                  | C <sub>oss</sub>    | —                        | 3.4 | —   | pF   |   |
| Reverse Transfer Capacitance        | C <sub>rss</sub>    | —                        | 1.4 | —   | pF   |   |
| <b>SWITCHING CHARACTERISTICS</b>    |                     |                          |     |     |      |   |
| Turn-On Delay Time                  | t <sub>D(ON)</sub>  | —                        | 10  | —   | ns   | V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.115A, R <sub>L</sub> = 150Ω, V <sub>GEN</sub> = 10V, R <sub>GEN</sub> = 25Ω |
| Turn-Off Delay Time                 | t <sub>D(OFF)</sub> | —                        | 33  | —   | ns   |   |

- Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. No purposefully added lead. Halogen and Antimony Free.
  3. Short duration pulse test used to minimize self-heating effect.
  4. Product manufactured with Data Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date Code V9 are built with Non-Green Molding Compound and may contain Halogens or Sb203 Fire Retardants.

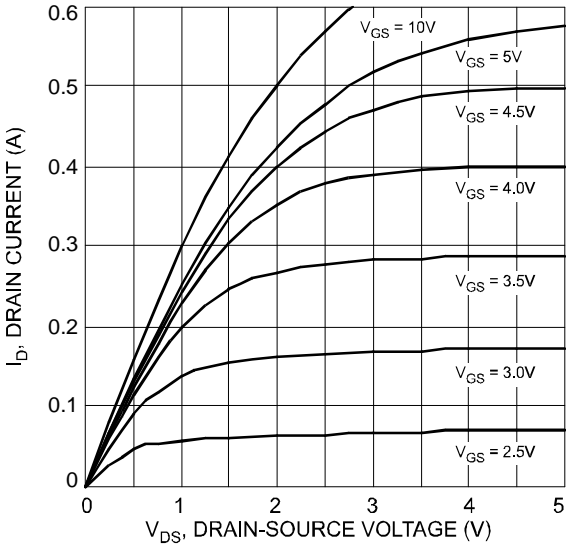


Fig. 1 Typical Output Characteristic

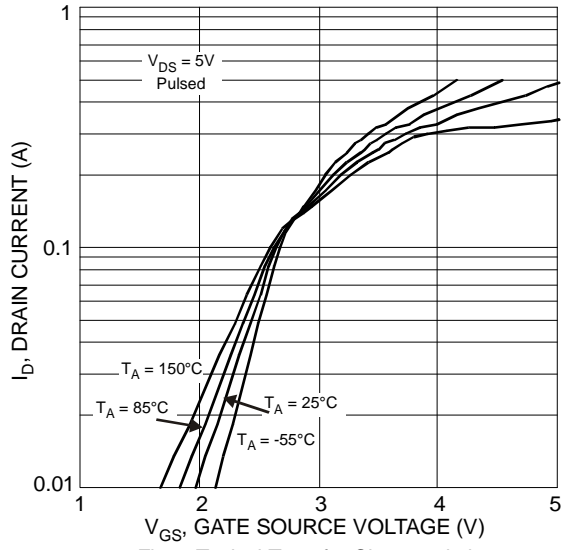


Fig. 2 Typical Transfer Characteristics

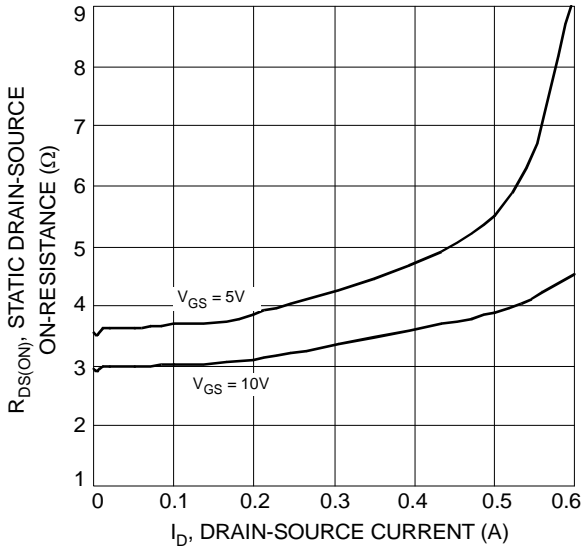


Fig. 3 On-Resistance vs. Drain Current & Gate Voltage

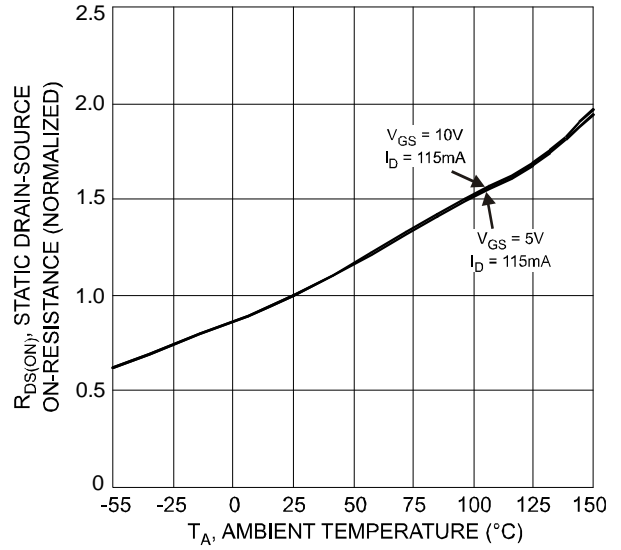


Fig. 4 Normalized Static Drain-Source On-Resistance vs. Ambient Temperature

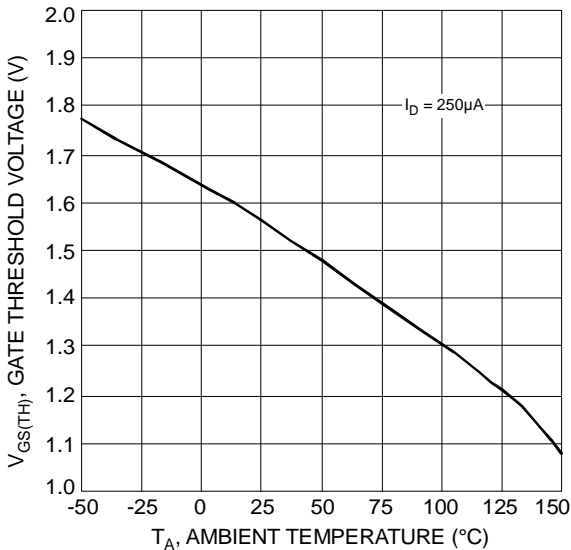


Fig. 5 Gate Threshold Variation vs. Ambient Temperature

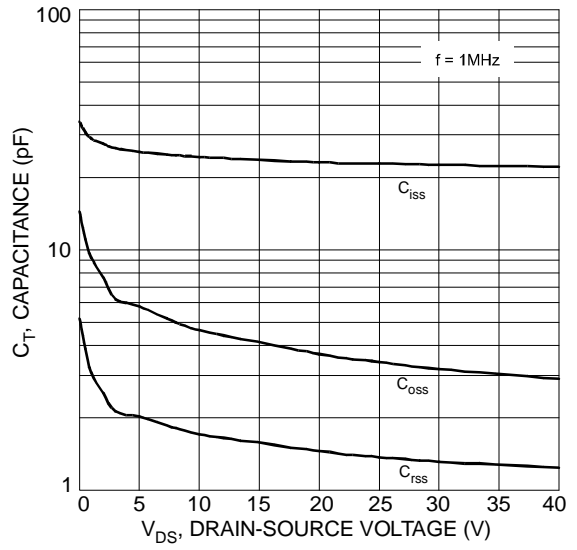


Fig. 6 Typical Total Capacitance

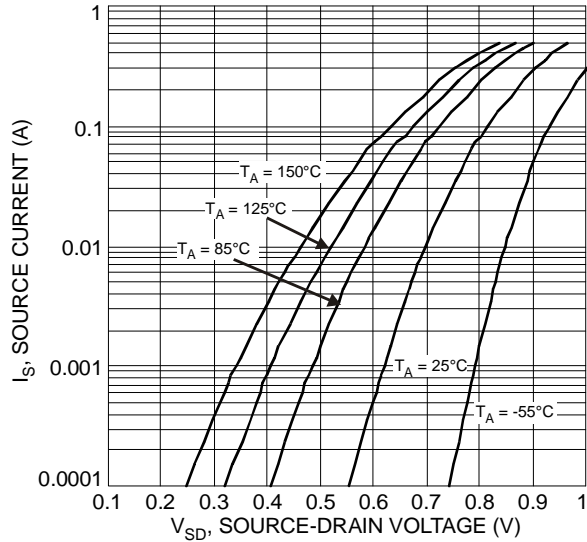


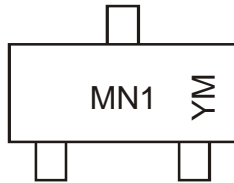
Fig. 7 Reverse Drain Current vs. Source-Drain Voltage

**Ordering Information** (Note 5)

| Part Number | Case   | Packaging        |
|-------------|--------|------------------|
| 2N7002A-7   | SOT-23 | 3000/Tape & Reel |

Notes: 5. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**



MN1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: V = 2008  
 M = Month ex: 9 = September

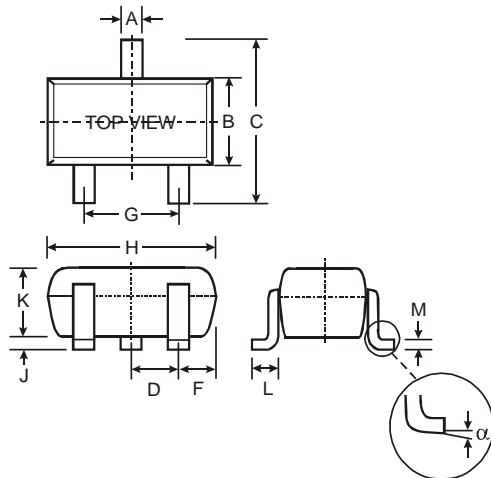
Date Code Key

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------|------|------|------|------|------|------|------|------|
| Code | V    | W    | X    | Y    | Z    | A    | B    | C    |

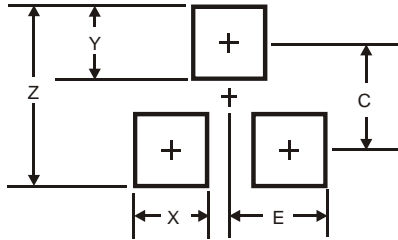
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

**Package Outline Dimensions**



| SOT-23               |       |       |
|----------------------|-------|-------|
| Dim                  | Min   | Max   |
| A                    | 0.37  | 0.51  |
| B                    | 1.20  | 1.40  |
| C                    | 2.30  | 2.50  |
| D                    | 0.89  | 1.03  |
| F                    | 0.45  | 0.60  |
| G                    | 1.78  | 2.05  |
| H                    | 2.80  | 3.00  |
| J                    | 0.013 | 0.10  |
| K                    | 0.903 | 1.10  |
| L                    | 0.45  | 0.61  |
| M                    | 0.085 | 0.180 |
| $\alpha$             | 0°    | 8°    |
| All Dimensions in mm |       |       |

**Suggested Pad Layout**



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

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