

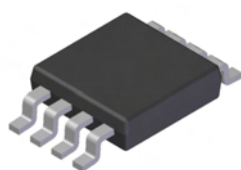
## Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

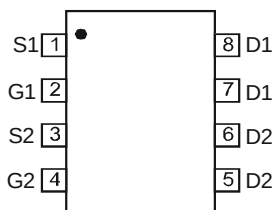
## Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Marking Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.072 grams (approximate)

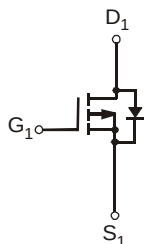
SO-8



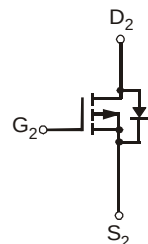
Top View



Top View  
Internal Schematic



P-Channel MOSFET



P-Channel MOSFET

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

| Characteristic                                            |              |                                                | Symbol           | Value      | Unit |
|-----------------------------------------------------------|--------------|------------------------------------------------|------------------|------------|------|
| Drain-Source Voltage                                      |              |                                                | V <sub>DSS</sub> | -20        | V    |
| Gate-Source Voltage                                       |              |                                                | V <sub>GSS</sub> | ±12        | V    |
| Continuous Drain Current (Note 3) V <sub>GS</sub> = -4.5V | Steady State | T <sub>A</sub> = 25°C<br>T <sub>A</sub> = 85°C | I <sub>D</sub>   | -4.6<br>-3 | A    |
| Pulsed Drain Current (Note 4)                             |              |                                                | I <sub>DM</sub>  | -20        | A    |

## Thermal Characteristics

| Characteristic                                                 | Symbol                            | Value       | Unit |
|----------------------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 3)                                     | P <sub>D</sub>                    | 1.15        | W    |
| Thermal Resistance, Junction to Ambient @T <sub>A</sub> = 25°C | R <sub>θJA</sub>                  | 109         | °C/W |
| Operating and Storage Temperature Range                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  3. Device mounted on FR-4 PCB, with minimum recommended pad layout.
  4. Repetitive rating, pulse width limited by junction temperature.

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

| Characteristic                                        | Symbol              | Min   | Typ      | Max       | Unit | Test Condition                                                                                                      |
|-------------------------------------------------------|---------------------|-------|----------|-----------|------|---------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 5)</b>                   |                     |       |          |           |      |                                                                                                                     |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>   | -20   | -        | -         | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                                       |
| Zero Gate Voltage Drain Current T <sub>J</sub> = 25°C | I <sub>DSS</sub>    | -     | -        | -1.0      | μA   | V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V                                                                        |
| Gate-Source Leakage                                   | I <sub>GSS</sub>    | -     | -        | ±100      | nA   | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V                                                                        |
| <b>ON CHARACTERISTICS (Note 5)</b>                    |                     |       |          |           |      |                                                                                                                     |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | -0.45 | -        | -1.1      | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                                         |
| Static Drain-Source On-Resistance                     | R <sub>DS(on)</sub> | -     | 55<br>76 | 75<br>110 | mΩ   | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4.8A                                                                     |
|                                                       |                     |       |          |           |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -1A                                                                       |
| Forward Transfer Admittance                           | Y <sub>fs</sub>     | -     | 10       | -         | S    | V <sub>DS</sub> = -9V, I <sub>D</sub> = -3.4A                                                                       |
| Diode Forward Voltage                                 | V <sub>SD</sub>     | -     | -0.8     | -1.2      | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A                                                                          |
| <b>DYNAMIC CHARACTERISTICS (Note 6)</b>               |                     |       |          |           |      |                                                                                                                     |
| Input Capacitance                                     | C <sub>iss</sub>    | -     | 608.4    | -         | pF   | V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                                           |
| Output Capacitance                                    | C <sub>oss</sub>    | -     | 81.5     | -         | pF   |                                                                                                                     |
| Reverse Transfer Capacitance                          | C <sub>rss</sub>    | -     | 72.4     | -         | pF   |                                                                                                                     |
| Gate Resistance                                       | R <sub>g</sub>      | -     | 44.91    | -         | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                                                |
| Total Gate Charge                                     | Q <sub>g</sub>      | -     | 6.5      | -         | nC   | V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V,<br>I <sub>D</sub> = -3.2A                                          |
| Gate-Source Charge                                    | Q <sub>gs</sub>     | -     | 0.9      | -         | nC   |                                                                                                                     |
| Gate-Drain Charge                                     | Q <sub>gd</sub>     | -     | 1.5      | -         | nC   |                                                                                                                     |
| Turn-On Delay Time                                    | t <sub>D(on)</sub>  | -     | 12.45    | -         | ns   | V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V,<br>R <sub>L</sub> = 10Ω, R <sub>G</sub> = 1Ω, I <sub>D</sub> = -1A |
| Turn-On Rise Time                                     | t <sub>r</sub>      | -     | 10.29    | -         | ns   |                                                                                                                     |
| Turn-Off Delay Time                                   | t <sub>D(off)</sub> | -     | 46.52    | -         | ns   |                                                                                                                     |
| Turn-Off Fall Time                                    | t <sub>f</sub>      | -     | 22.19    | -         | ns   |                                                                                                                     |

Notes: 5. Short duration pulse test used to minimize self-heating effect.  
6. Guaranteed by design. Not subject to production testing.

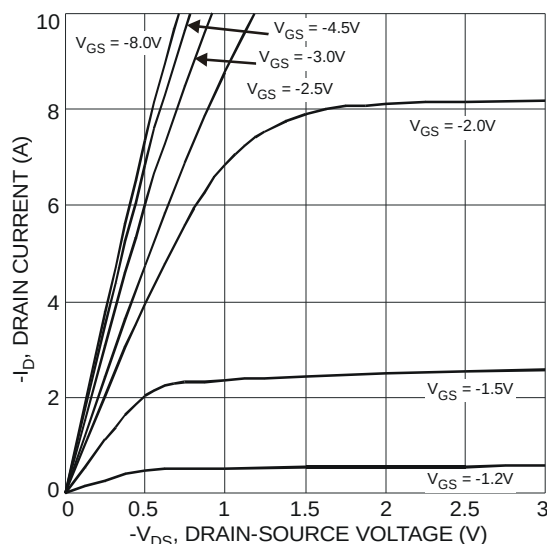


Fig. 1 Typical Output Characteristics

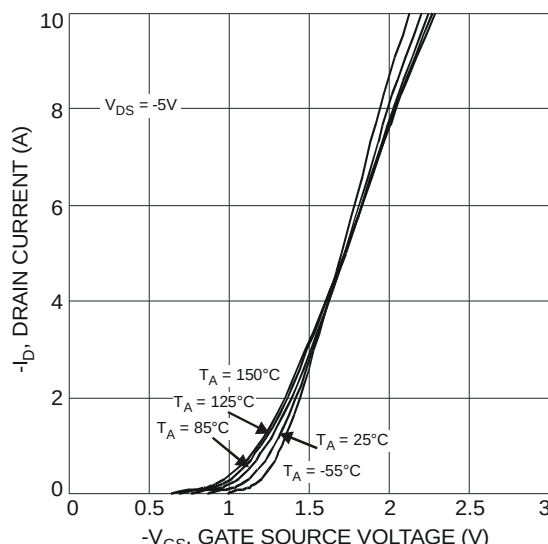


Fig. 2 Typical Transfer Characteristics

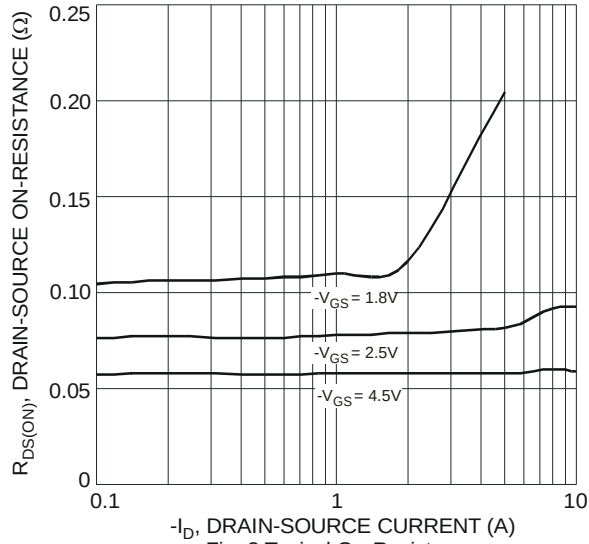


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

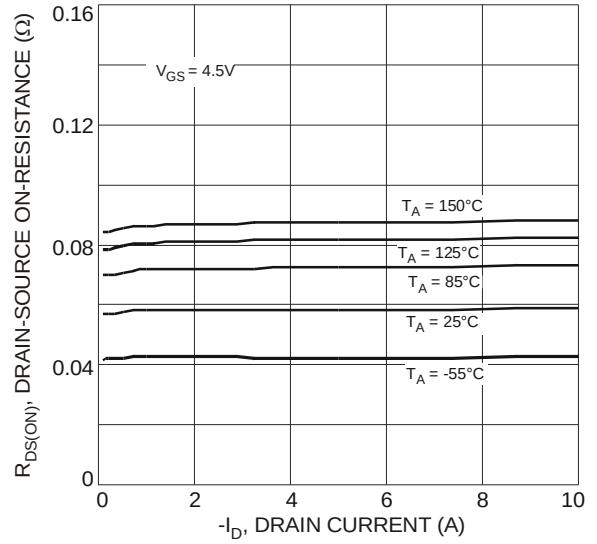


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

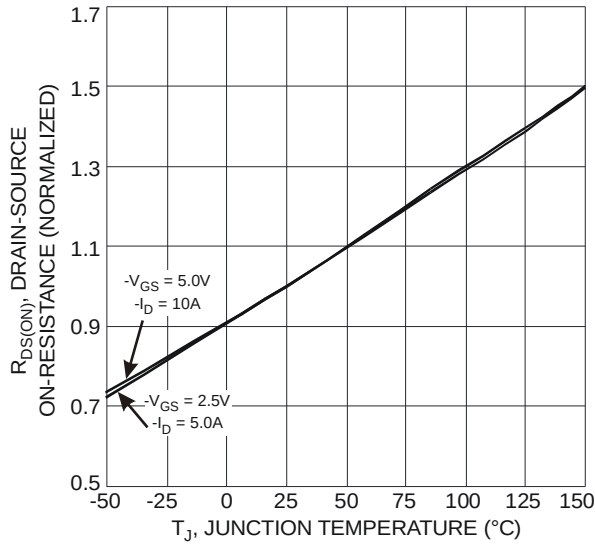


Fig. 5 On-Resistance Variation with Temperature

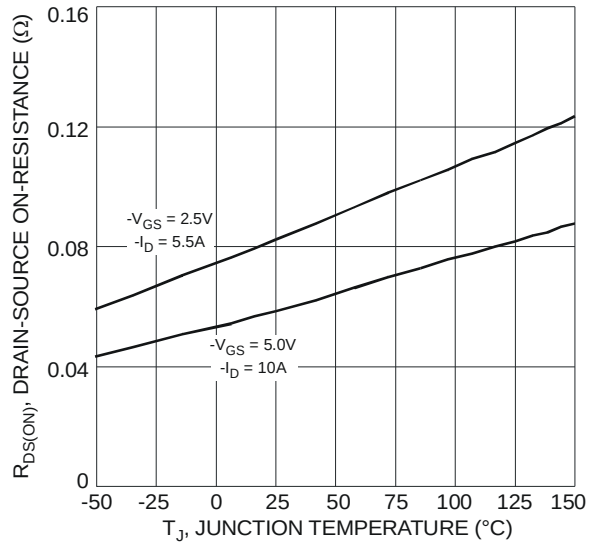


Fig. 6 On-Resistance Variation with Temperature

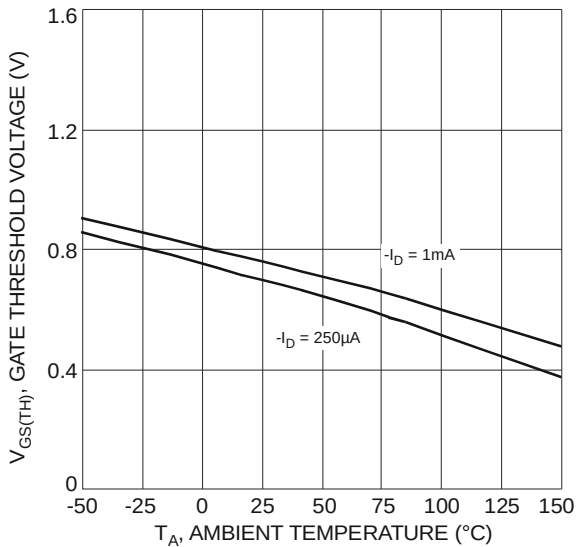


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

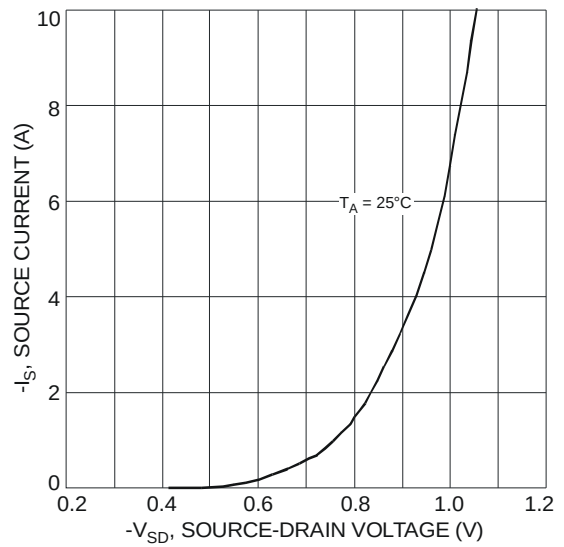
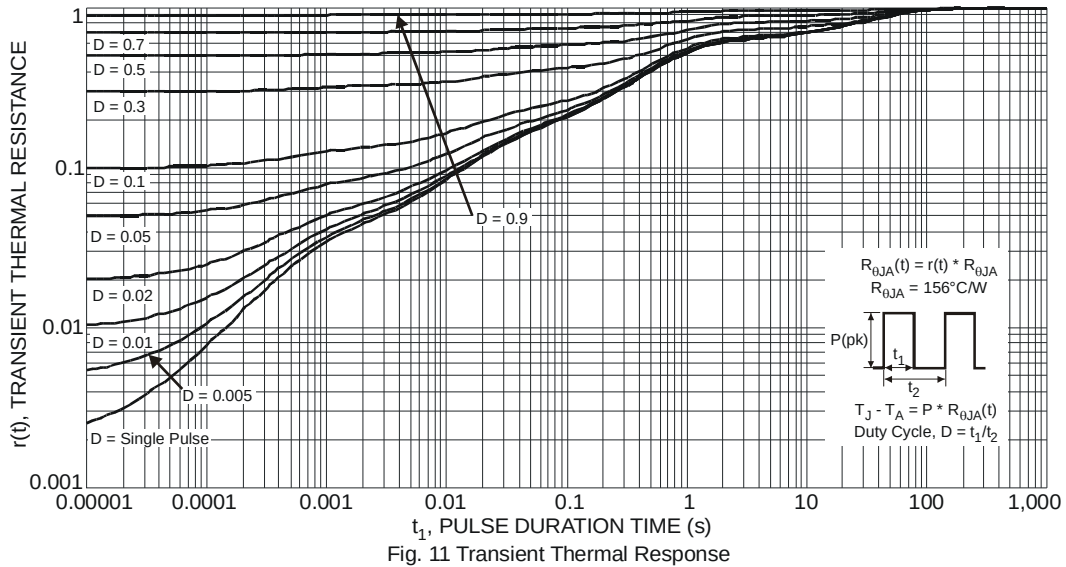
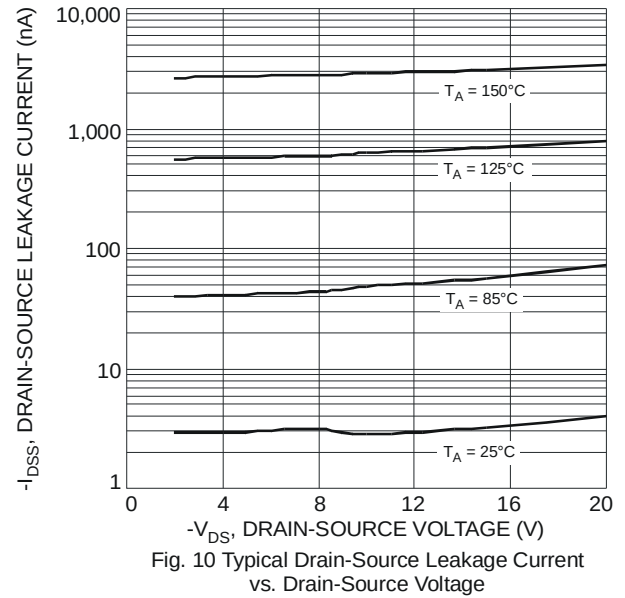
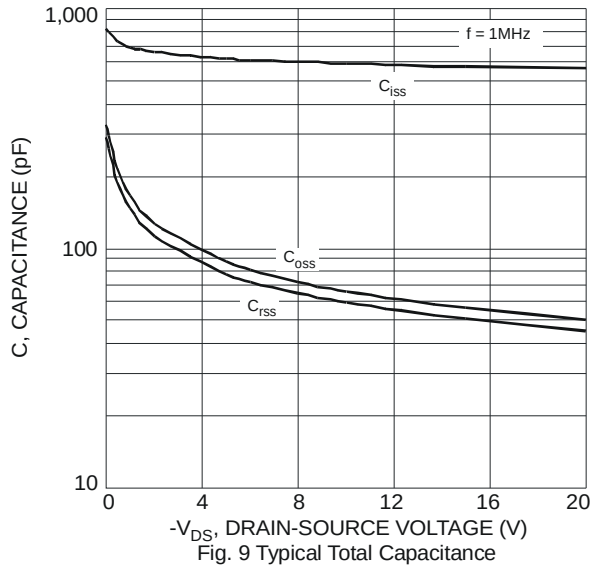


Fig. 8 Diode Forward Voltage vs. Current

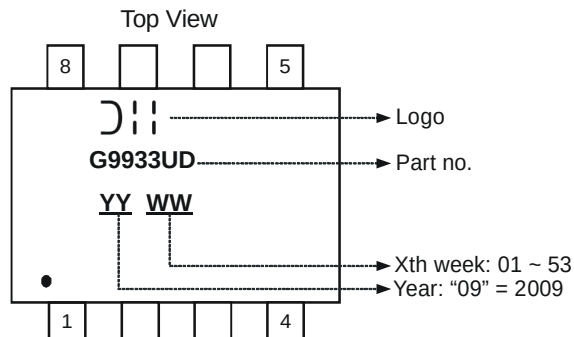


## Ordering Information (Note 7)

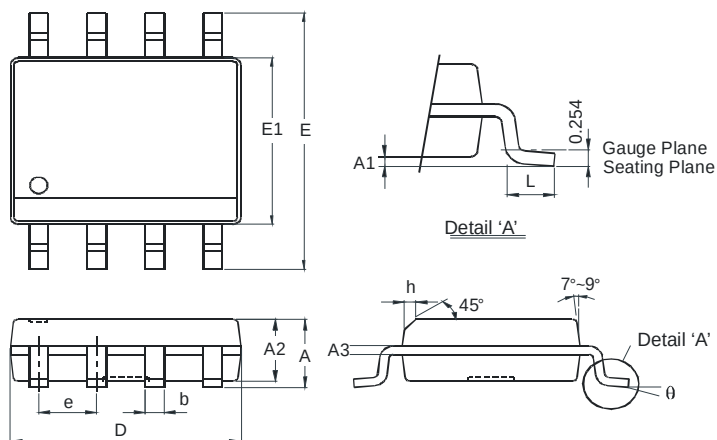
| Part Number   | Case | Packaging          |
|---------------|------|--------------------|
| DMG9933USD-13 | SO-8 | 2500 / Tape & Reel |

Notes: 7. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information

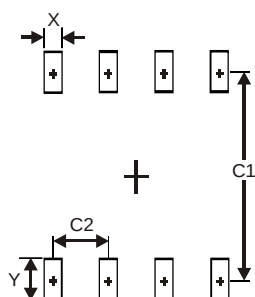


## Package Outline Dimensions



| SO-8                 |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | -        | 1.75 |
| A1                   | 0.10     | 0.20 |
| A2                   | 1.30     | 1.50 |
| A3                   | 0.15     | 0.25 |
| b                    | 0.3      | 0.5  |
| D                    | 4.85     | 4.95 |
| E                    | 5.90     | 6.10 |
| E1                   | 3.85     | 3.95 |
| e                    | 1.27 Typ |      |
| h                    | -        | 0.35 |
| L                    | 0.62     | 0.82 |
| θ                    | 0°       | 8°   |
| All Dimensions in mm |          |      |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| X          | 0.60          |
| Y          | 1.55          |
| C1         | 5.4           |
| C2         | 1.27          |

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