

## Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected up to 2kV**
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

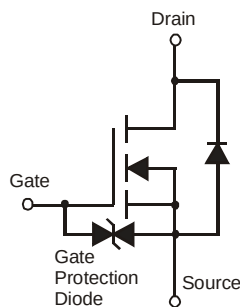
- Case: SOT523
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.002 grams (approximate)



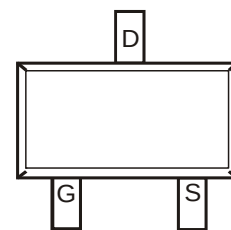
SOT523



Top View



Equivalent Circuit



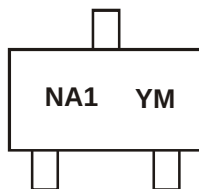
Top View

## Ordering Information (Note 3)

| Part Number | Qualification | Case   | Packaging        |
|-------------|---------------|--------|------------------|
| DMG1012T-7  | Commercial    | SOT523 | 3000/Tape & Reel |
| DMG1012TQ-7 | Automotive    | SOT523 | 3000/Tape & Reel |

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

## Marking Information



NA1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: W = 2009)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------|------|------|------|------|------|------|------|
| Code | 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   |

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

| Characteristic                    |              |                       | Symbol           | Value | Units |
|-----------------------------------|--------------|-----------------------|------------------|-------|-------|
| Drain-Source Voltage              |              |                       | V <sub>DSS</sub> | 20    | V     |
| Gate-Source Voltage               |              |                       | V <sub>GSS</sub> | ±6    | V     |
| Continuous Drain Current (Note 4) | Steady State | T <sub>A</sub> = 25°C | I <sub>D</sub>   | 0.63  | A     |
|                                   |              | T <sub>A</sub> = 85°C |                  | 0.45  |       |
| Pulsed Drain Current              |              |                       | I <sub>DM</sub>  | 6     | A     |

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

| Characteristic                          | Symbol                            | Value       | Units |
|-----------------------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 4)        | P <sub>D</sub>                    | 0.28        | W     |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | 452         | °C/W  |
| 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 (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>    | -   | -     | 100  | nA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V                                                                             |
| Gate-Source Leakage                                   | I <sub>GSS</sub>    | -   | -     | ±1.0 | μA   | V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V                                                                           |
| <b>ON CHARACTERISTICS (Note 5)</b>                    |                     |     |       |      |      |                                                                                                                         |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | 0.5 | -     | 1.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                                              |
| Static Drain-Source On-Resistance                     | R <sub>DS(on)</sub> | -   | 0.3   | 0.4  | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA                                                                          |
|                                                       |                     |     | 0.4   | 0.5  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA                                                                          |
|                                                       |                     |     | 0.5   | 0.7  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA                                                                          |
| Forward Transfer Admittance                           | Y <sub>fs</sub>     | -   | 1.4   | -    | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA                                                                           |
| Diode Forward Voltage (Note 5)                        | V <sub>SD</sub>     | -   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA                                                                            |
| <b>DYNAMIC CHARACTERISTICS</b>                        |                     |     |       |      |      |                                                                                                                         |
| Input Capacitance                                     | C <sub>iss</sub>    | -   | 60.67 | -    | pF   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                                              |
| Output Capacitance                                    | C <sub>oss</sub>    | -   | 9.68  | -    | pF   |                                                                                                                         |
| Reverse Transfer Capacitance                          | C <sub>rss</sub>    | -   | 5.37  | -    | pF   |                                                                                                                         |
| Total Gate Charge                                     | Q <sub>g</sub>      | -   | 736.6 | -    | pC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V,<br>I <sub>D</sub> = 250mA                                                |
| Gate-Source Charge                                    | Q <sub>gs</sub>     | -   | 93.6  | -    | pC   |                                                                                                                         |
| Gate-Drain Charge                                     | Q <sub>gd</sub>     | -   | 116.6 | -    | pC   |                                                                                                                         |
| Turn-On Delay Time                                    | t <sub>D(on)</sub>  | -   | 5.1   | -    | ns   | V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω,<br>I <sub>D</sub> = 200mA |
| Turn-On Rise Time                                     | t <sub>r</sub>      | -   | 7.4   | -    | ns   |                                                                                                                         |
| Turn-Off Delay Time                                   | t <sub>D(off)</sub> | -   | 26.7  | -    | ns   |                                                                                                                         |
| Turn-Off Fall Time                                    | t <sub>f</sub>      | -   | 12.3  | -    | ns   |                                                                                                                         |

- Notes:
- Device mounted on FR-4 PCB.
  - Short duration pulse test used to minimize self-heating effect.

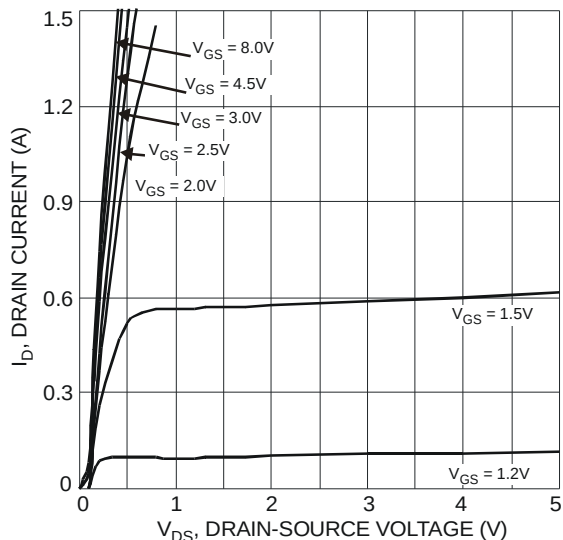


Fig. 1 Typical Output Characteristics

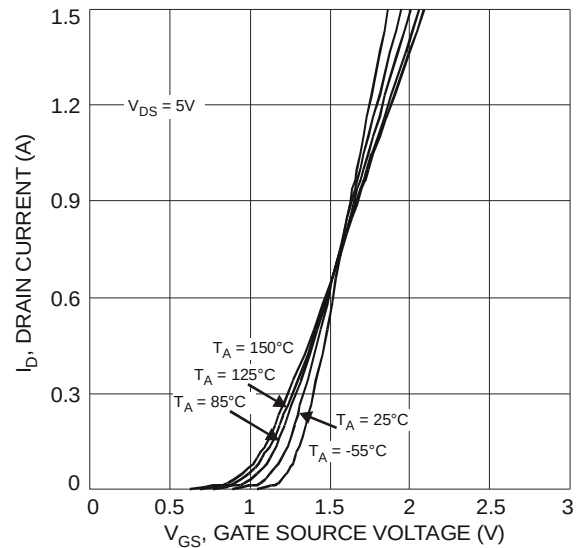


Fig. 2 Typical Transfer Characteristics

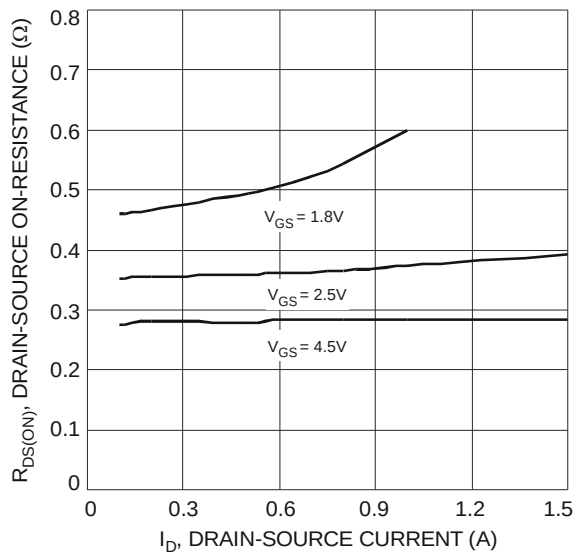


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

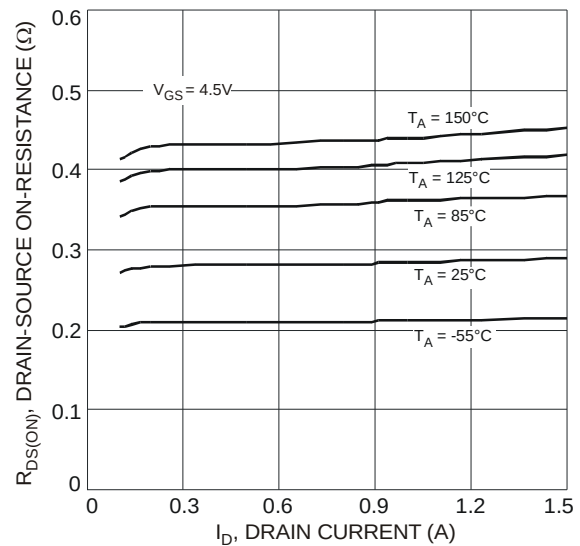


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

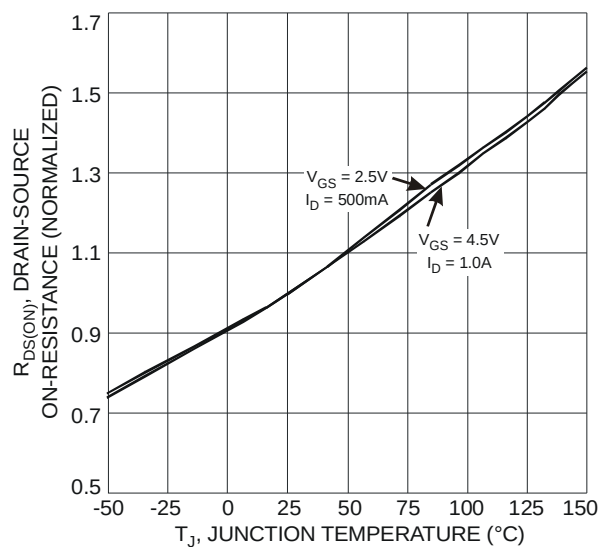


Fig. 5 On-Resistance Variation with Temperature

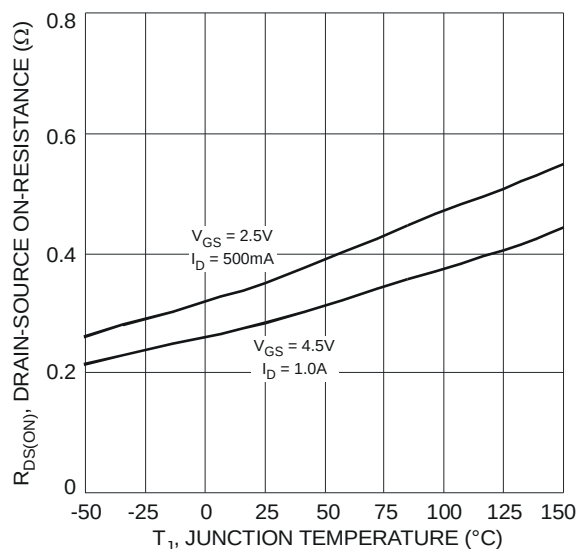


Fig. 6 On-Resistance Variation with Temperature

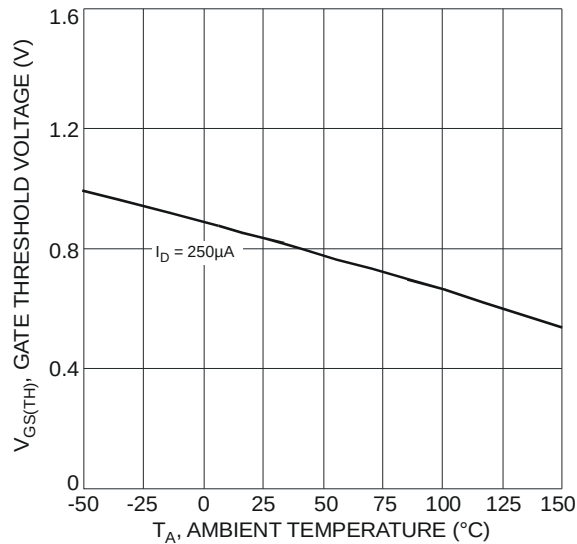


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

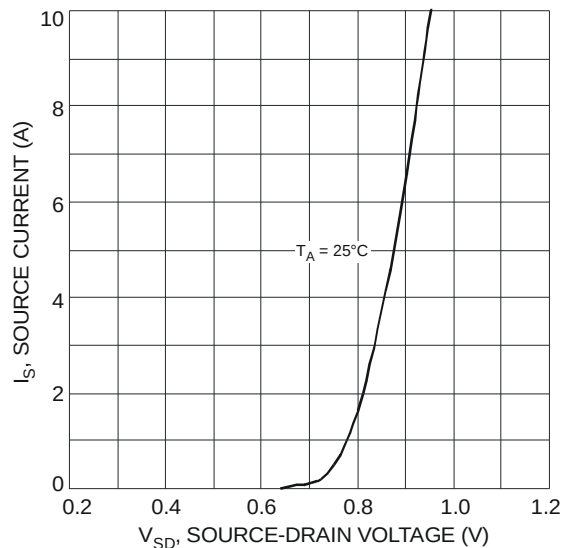


Fig. 8 Diode Forward Voltage vs. Current

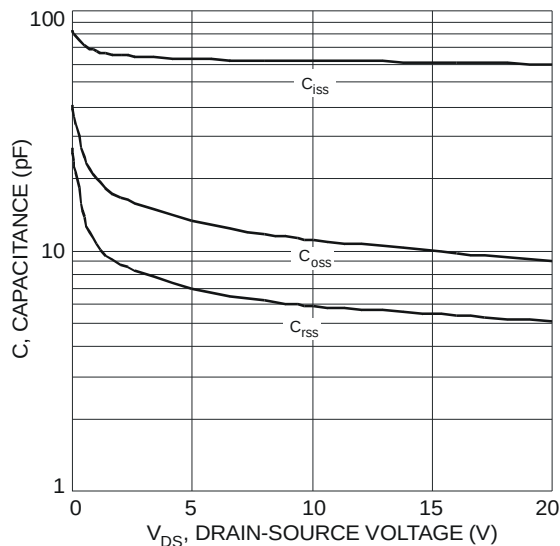


Fig. 9 Typical Capacitance

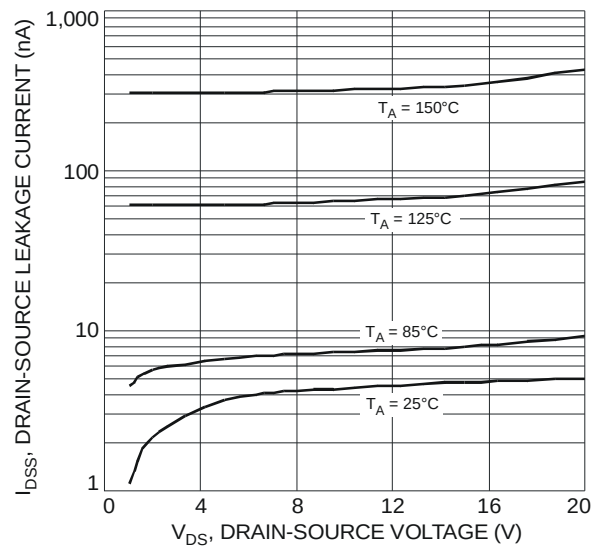


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

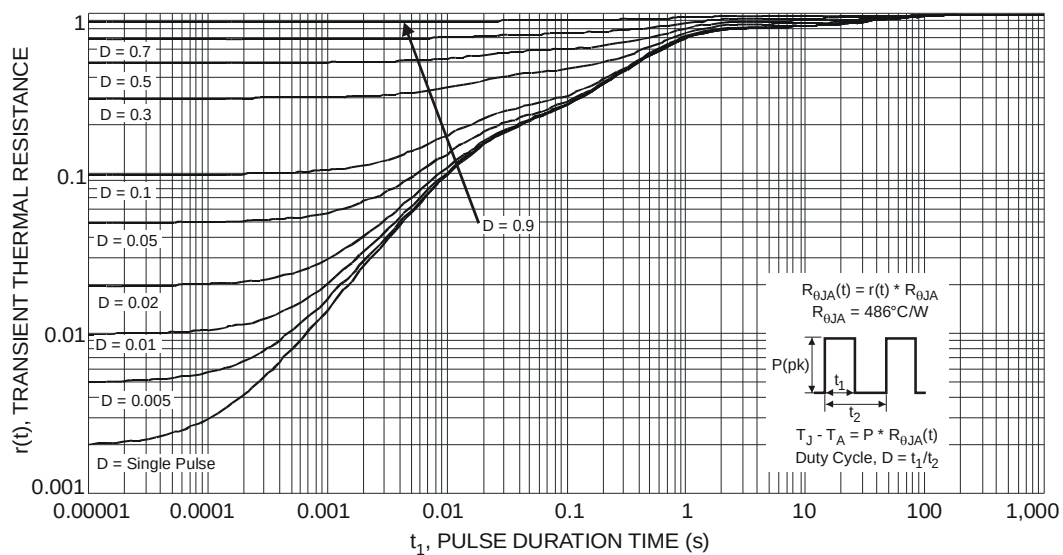
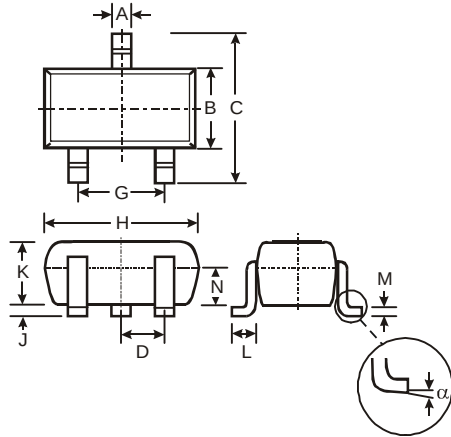


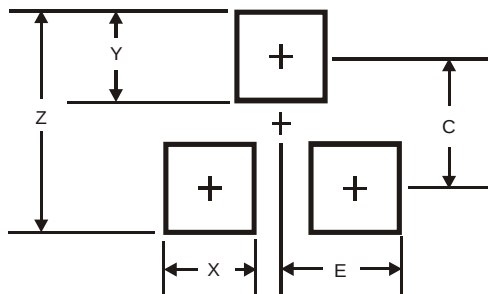
Fig. 11 Transient Thermal Response

## Package Outline Dimensions



| SOT523               |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.22 |
| B                    | 0.75 | 0.85 | 0.80 |
| C                    | 1.45 | 1.75 | 1.60 |
| D                    | —    | —    | 0.50 |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| J                    | 0.00 | 0.10 | 0.05 |
| K                    | 0.60 | 0.80 | 0.75 |
| L                    | 0.10 | 0.30 | 0.22 |
| M                    | 0.10 | 0.20 | 0.12 |
| N                    | 0.45 | 0.65 | 0.50 |
| α                    | 0°   | 8°   | —    |
| All Dimensions in mm |      |      |      |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 1.8           |
| X          | 0.4           |
| Y          | 0.51          |
| C          | 1.3           |
| E          | 0.7           |

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