Features
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected up to 2kV
- Totally Lead-Free & Fully 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: SOT523
- 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 @3
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)

Ordering Information (Note 5)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Qualification</th>
<th>Case</th>
<th>Packaging</th>
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<tr>
<td>DMG1012T-7</td>
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<td>SOT523</td>
<td>3000/Tape &amp; Reel</td>
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<td>DMG1012T-13</td>
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<td>DMG1012TQ-7</td>
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<td>3000/Tape &amp; Reel</td>
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Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. 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.
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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to https://www.diodes.com/quality/.
5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
6. The ESD gate protection diode is only designed to protect against ESD events. No gate-source voltage greater than the maximum $V_{GSS}$ rating (given on page 2) can be applied.

Marking Information

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<td>NA1 = Product Type Marking Code</td>
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<td>YM = Date Code Marking</td>
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<td>Y = Year (ex: F = 2018)</td>
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### Maximum Ratings (@\(T_A = +25^\circ\text{C}\), unless otherwise specified.)

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<th>Characteristic</th>
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<th>Unit</th>
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<tr>
<td>Drain-Source Voltage</td>
<td>(V_{DSS})</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>(V_{GSS})</td>
<td>±6</td>
<td>V</td>
</tr>
<tr>
<td>Continuous Drain Current (Note 7) Steady State</td>
<td>(I_D)</td>
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<td>Pulsed Drain Current</td>
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### Thermal Characteristics (@\(T_A = +25^\circ\text{C}\), unless otherwise specified.)

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<th>Characteristic</th>
<th>Symbol</th>
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<th>Unit</th>
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<tbody>
<tr>
<td>Total Power Dissipation (Note 7)</td>
<td>(P_D)</td>
<td>0.28</td>
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<tr>
<td>Thermal Resistance, Junction to Ambient (Note 7)</td>
<td>(R_{JA})</td>
<td>452</td>
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<tr>
<td>Operating and Storage Temperature Range</td>
<td>(T_J, T_{STG})</td>
<td>-55 to +150</td>
<td>°C</td>
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### Electrical Characteristics (@\(T_A = +25^\circ\text{C}\), unless otherwise specified.)

#### OFF CHARACTERISTICS (Note 8)
- Drain-Source Breakdown Voltage: \(BV_{DSS}\) 20 V
- Zero Gate Voltage Drain Current \(T_J = +25^\circ\text{C}\): \(I_{GSS}\) 100 nA
- Gate-Source Leakage: \(I_{GSS}\) ±1.0 µA

#### ON CHARACTERISTICS (Note 8)
- Gate Threshold Voltage: \(V_{GS(TH)}\) 0.5 V
- Static Drain-Source On-Resistance: \(R_{DS(ON)}\) 0.3 \(\Omega\)
- Forward Transfer Admittance: \(|Y_{DS}|\) 1.4 S
- Diode Forward Voltage: \(V_{SD}\) 0.7 V

#### DYNAMIC CHARACTERISTICS (Note 9)
- Input Capacitance: \(C_{iss}\) 60.67 pF
- Output Capacitance: \(C_{oss}\) 9.88 pF
- Reverse Transfer Capacitance: \(C_{rss}\) 5.37 pF
- Total Gate Charge: \(Q_g\) 736.6 pC
- Gate-Source Charge: \(Q_{gs}\) 93.6 pC
- Gate-Drain Charge: \(Q_{gd}\) 116.6 pC
- Turn-On Delay Time: \(t_{D(ON)}\) 5.1 ns
- Turn-On Rise Time: \(t_R\) 7.4 ns
- Turn-Off Delay Time: \(t_{D(OFF)}\) 26.7 ns
- Turn-Off Fall Time: \(t_f\) 12.3 ns

Notes:
- 7. Device mounted on FR-4 PCB, with minimum recommended pad layout. 
- 8. Short duration pulse test used to minimize self-heating effect. 
- 9. Guaranteed by design. Not subject to product testing.
Fig. 1 Typical Output Characteristics

V, DRAIN-SOURCE VOLTAGE (V)

I, DRAIN CURRENT (A)

V = 1.2V
V = 1.5V
V = 2.0V
V = 2.5V
V = 3.0V
V = 4.5V
V = 8.0V

Fig. 2 Typical Transfer Characteristics

V, GATE SOURCE VOLTAGE (V)

I, DRAIN CURRENT (A)

V = 5V

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

R, DRAIN-SOURCE ON-RESISTANCE (O)

I, DRAIN-SOURCE CURRENT (A)

V = 4.5V
I = 1.0A
V = 2.5V
I = 500mA

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

V, DRAIN-SOURCE VOLTAGE (V)

I, DRAIN CURRENT (A)

V = 1.8V
I = 1.0A
V = 2.5V
I = 500mA

Fig. 5 On-Resistance Variation with Temperature

T, JUNCTION TEMPERATURE (°C)

R, DRAIN-SOURCE ON-RESISTANCE (O)

R, DRAIN-SOURCE ON-RESISTANCE (NORMALIZED)

Fig. 6 On-Resistance Variation with Temperature

T, JUNCTION TEMPERATURE (°C)
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 SOA, Safe Operation Area
Fig. 11 Transient Thermal Response

\[ T_{\text{RINSE}} - T_{\text{RHEAT}} = P \cdot R(t) \]

Duty Cycle, \( D = \frac{t}{t_1} \)

\[ R_{\text{θJA}}(t) = r(t) \cdot R_{\theta JA} \]

\( R_{\theta JA} = 486 \, ^\circ C/W \)
Package Outline Dimensions
Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT523

<table>
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<th>Dim</th>
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All Dimensions in mm

Suggested Pad Layout
Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT523

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<tr>
<th>Dimensions</th>
<th>Value (in mm)</th>
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