**GENERAL DESCRIPTION**

The ADMP803 is a high-performance MEMS microphone with a unique combination of very low self-noise, tiny package volume (7.3 mm³), and low power consumption. Running from a 1 V supply, the ADMP803 consumes only 17 µA of current while providing an equivalent input noise of 27 dBA SPL with an analog 4.5 kΩ impedance output. These features, combined with the benefits of MEMS technology, reflow solder compatibility, and a highly stable response over time and temperature, make the ADMP803 an ideal microphone choice for assistive listening devices (ALDs) such as hearing aids.

**APPLICATIONS**

- Hearing Aids
- Hearing Aid Accessories
- Assistive Listening/Alerting and Signaling Systems
- Audiometers
- Bone Conduction Devices
- Hearing Protection

**FEATURES**

- Small Surface-Mount Package: 3.35 × 2.5 × 0.98 mm
- Extra Ground Pin Improves Hand Assembly
- Equivalent Input Noise: 27 dBA SPL
- Sensitivity: −35 dBV
- Hearing Aid-Compatible Voltage Range: 0.9 to 1.3 V
- Low Current Consumption: 17 µA
- 0.8 Sec Startup to Within 0.2 dB of 1 kHz Sensitivity
- Flat Frequency Response
- Good Sensitivity and Frequency Response Matching
- Single-Ended Analog Output
- Compatible with Sn/Pb and Pb-Free Solder Processes
- RoHS/WEEE Compliant

**FUNCTIONAL BLOCK DIAGRAM**

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>PART</th>
<th>TEMP RANGE</th>
<th>PACKAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMP803JCEZ-RL</td>
<td>−5°C to +65°C*</td>
<td>CE-4-1</td>
</tr>
<tr>
<td>ADMP803JCEZ-RL7</td>
<td>−5°C to +65°C†</td>
<td>CE-4-1</td>
</tr>
<tr>
<td>EVAL-ADMP803Z-FLEX</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* – 13” Tape and Reel   † – 7” Tape and Reel
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## SPECIFICATIONS

### TABLE 1. ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = −5 to 65°C, V<sub>DD</sub> = 1.0V, 200 kΩ load unless otherwise noted. All minimum and maximum specifications are guaranteed across temperature and voltage, and are specified in Table 1, unless otherwise noted. Typical specifications are not guaranteed.)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP&lt;sup&gt;1&lt;/sup&gt;</th>
<th>MAX</th>
<th>UNITS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directionality</td>
<td>Omni</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>1 kHz, 94 dB SPL</td>
<td>−38</td>
<td>−35</td>
<td>−32</td>
<td>dBV</td>
<td></td>
</tr>
<tr>
<td>Equivalent Input Noise (EIN)</td>
<td>8 kHz bandwidth, A-weighted</td>
<td>27</td>
<td>29</td>
<td>dBA SPL</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 kHz bandwidth, A-weighted</td>
<td>29</td>
<td>dBA SPL</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Response</td>
<td>Low frequency −3 dB point</td>
<td>80</td>
<td>Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resonant Peak</td>
<td></td>
<td>10.2</td>
<td>kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Harmonic Distortion (THD)</td>
<td></td>
<td>105 dB SPL</td>
<td>1.3</td>
<td>2.5</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Power Supply Rejection Ratio (PSRR)</td>
<td>1 kHz, 100 mV p-p sine wave superimposed on V&lt;sub&gt;DD&lt;/sub&gt;</td>
<td>−40</td>
<td>−53</td>
<td>dB</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Input-Reflected Vibration Sensitivity</td>
<td>1 kHz acceleration, axial direction</td>
<td>62</td>
<td>dB SPL/g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustic Overload Point</td>
<td>10% THD</td>
<td>108</td>
<td>110</td>
<td>dB SPL</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Start-Up Time</td>
<td>To within ±0.2 dB of final sensitivity</td>
<td>0.8</td>
<td>sec</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### POWER SUPPLY

| Supply Voltage (V<sub>DD</sub>) | | 0.9 | 1.3 | V | |
| Supply Current (I<sub>S</sub>) | Unloaded; no tone applied | 10 | 17 | 23 | µA | |
| | V<sub>DD</sub> = 0.9 V | 16 | µA | | |
| | V<sub>DD</sub> = 1.3 V | 19.5 | µA | | |

### OUTPUT CHARACTERISTICS

| Output Impedance (Z<sub>OUT</sub>) | | 2.9 | 4.5 | 10.5 | kΩ | 2 | |
| Output DC Bias Voltage | | 500 | 570 | 650 | mV | 2 | |
| Output Current Limit | | 25 | µA | | |
| Maximum Output Voltage | 110 dB SPL input, peak | 159 | mV | | |
| Noise Floor | 20 Hz to 20 kHz, A-weighted, RMS | −100 | dBV | | |

**Note 1:** Typical specifications at 25°C

**Note 2:** Guaranteed by design and/or characterization
ABSOLUTE MAXIMUM RATINGS
Stress above those listed as Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to the absolute maximum ratings conditions for extended periods may affect device reliability.

TABLE 2. ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (VDD)</td>
<td>−0.3 V to +1.45 V</td>
</tr>
<tr>
<td>Sound Pressure Level</td>
<td>160 dB</td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>10,000 g</td>
</tr>
<tr>
<td>Vibration</td>
<td>Per MIL-STD-883 Method 2007, Test Condition B</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>−5°C to +65°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>−55°C to +150°C</td>
</tr>
</tbody>
</table>

REFLOW SOLDERING
Reflow soldering must be performed in accordance with the JEDEC J-STD-020D Pb-free reflow profile for temperatures (260°C maximum), ramp rates, and dwell times. The ADMP803 can withstand many different reflow profiles, but a review of the AN-1068 Application Note, Reflow Soldering of the MEMS Microphone, is recommended for suggestions on ways to prevent flux contamination from entering the microphone.

ESD CAUTION
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore proper ESD precautions should be taken to avoid performance degradation or loss of functionality.
PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS

Figure 1. Pin Configuration

TOP VIEW
(Not to Scale)
TERMINAL SIDE DOWN

Figure 2. Pin Configuration Images (Bottom View and Top View)

TABLE 3. PIN FUNCTION DESCRIPTIONS

<table>
<thead>
<tr>
<th>PIN</th>
<th>NAME</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUTPUT</td>
<td>Analog Output Signal</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>VDD</td>
<td>Power Supply</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>
**TYPICAL PERFORMANCE CHARACTERISTICS**

**Figure 3. Typical Frequency Response**

**Figure 4. High Frequency Response**

**Figure 5. Typical Third-Octave Noise**
APPLICATIONS INFORMATION
OUTPUT IMPEDANCE CONSIDERATION
The ADMP3001 has an output impedance of 4.5 kΩ, which is significantly higher than the impedance of many other MEMS microphones. This higher output impedance enables the microphone to operate with a very low supply current, but also needs to be considered in the design of the signal chain following the microphone. The input impedance of the device to which the microphone’s output is connected should be much higher than 4.5 kΩ to ensure no loss of signal amplitude through the signal chain.

SUPPORTING DOCUMENTS
For additional information, see the following documents.

EVALUATION BOARD USER GUIDE
UG-325 Analog Output MEMS Microphone Flex Evaluation Board

APPLICATION NOTES
AN-1003 Recommendations for Mounting and Connecting the Invensense, Bottom-Ported MEMS Microphones
AN-1068 Reflow Soldering of the MEMS Microphone
AN-1112 Microphone Specifications Explained
AN-1124 Recommendations for Sealing Invensense, Bottom-Port MEMS Microphones from Dust and Liquid Ingress
AN-1140 Microphone Array Beamforming
AN-1165 Op Amps for MEMS Microphone Preamp Circuits

PCB DESIGN AND LAND PATTERN LAYOUT
The recommended PCB land pattern for the ADMP803 should be laid out to a 1:1 ratio to the solder pads on the microphone package, as shown in Figure 6. Take care to avoid applying solder paste to the sound hole in the PCB. A suggested solder paste stencil pattern layout is shown in Figure 7. The diameter of the sound hole in the PCB should be larger than the diameter of the sound port of the microphone. A minimum diameter of 0.5 mm is recommended.

Figure 6. PCB Land Pattern Layout
Dimensions shown in millimeters
**HANDLING INSTRUCTIONS**

**PICK AND PLACE EQUIPMENT**
The MEMS microphone can be handled using standard pick-and-place and chip shooting equipment. Take care to avoid damage to the MEMS microphone structure as follows:

- Use a standard pickup tool to handle the microphone. Because the microphone hole is on the bottom of the package, the pickup tool can make contact with any part of the lid surface.
- Do not pick up the microphone with a vacuum tool that makes contact with the bottom side of the microphone. Do not pull air out of or blow air into the microphone port.
- Do not use excessive force to place the microphone on the PCB.

**REFLOW SOLDER**
For best results, ensure that the soldering profile is in accordance with the recommendations of the manufacturer of the solder paste used to attach the MEMS microphone to the PCB. Perform all reflow soldering in accordance with the JEDEC J-STD-020 Pb-free reflow profile for temperatures (260°C maximum), ramp rates, and dwell times. The ADMP803 can withstand many different reflow profiles; however, for suggestions on how to prevent flux contamination from entering the microphone, see the AN-1068 Application Note, *Reflow Soldering of the MEMS Microphone*.

**BOARD WASH**
When washing the PCB, ensure that water does not make contact with the microphone port. Do not use blow-off procedures or ultrasonic cleaning.
OUTLINE DIMENSIONS

Figure 8. 3-Terminal Chip Array Small Outline No-Lead Cavity [LGA_CAV]
3.35 × 2.50 × 0.98 mm Body
(CE-3-5)
Dimensions shown in millimeters

ORDERING GUIDE

<table>
<thead>
<tr>
<th>PART1</th>
<th>TEMP RANGE</th>
<th>PACKAGE</th>
<th>PACKAGE OPTION2</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMP803JCEZ-RL</td>
<td>-5°C to +65°C</td>
<td>3-Terminal LGA_CAV*</td>
<td>CE-3-5</td>
<td>10,000</td>
</tr>
<tr>
<td>ADMP803JCEZ-RL7</td>
<td>-5°C to +65°C</td>
<td>3-Terminal LGA_CAV†</td>
<td>CE-3-5</td>
<td>1,000</td>
</tr>
<tr>
<td>EVAL-ADMP621Z-FLEX</td>
<td>—</td>
<td>Flexible Evaluation Board</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* – 13” Tape and Reel     Z = RoHS Compliant Part
† – 7” Tape and Reel     2This package option is halide free

REVISION HISTORY

<table>
<thead>
<tr>
<th>REVISION DATE</th>
<th>REVISION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/3/2013</td>
<td>1.0</td>
<td>Initial Release</td>
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</table>
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