

FEATURES

- Small and thin 3 mm × 4 mm × 1 mm surface-mount package
- High SNR of 60.5 dBA
- High sensitivity of -26 dBFS
- Flat frequency response from 100 Hz to over 12 kHz
- Low current consumption: <650 μA
- High PSRR of 80 dBFS
- Fourth-order Σ-Δ modulator
- Digital PDM output
- Compatible with Sn/Pb and Pb-free solder processes
- RoHS/WEEE compliant

APPLICATIONS

- Cell phones
- PC audio
- Digital cameras
- Bluetooth headsets

GENERAL DESCRIPTION

The ADMP421 is a low cost, low power, digital output bottom ported omnidirectional MEMS microphone. The ADMP421 consists of a MEMS microphone element, an output amplifier, and a fourth-order Σ-Δ modulator. The digital interface allows for the pulse density modulated (PDM) output of two microphones to be time multiplexed on a single data line using a single clock.

The ADMP421 has a high SNR and a high sensitivity, making it an excellent choice for far field applications. The ADMP421 has a flat wideband frequency response resulting in natural sound with high intelligibility. Low current consumption enables long battery life for portable applications. A built-in particle filter provides for high reliability.

The ADMP421 is available in a thin 3 mm × 4 mm × 1 mm surface-mount package. It is reflow solder compatible with no sensitivity degradation.

FUNCTIONAL BLOCK DIAGRAM

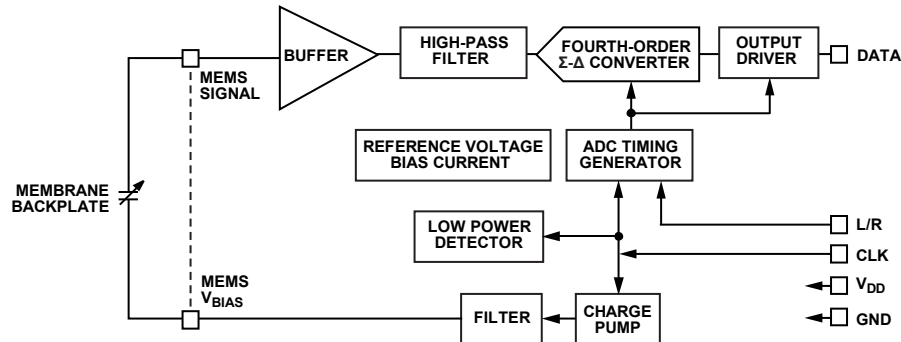


Figure 1.

Rev. PrA

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SPECIFICATIONS

$T_A = 25^\circ\text{C}$, $V_{DD} = 1.8\text{ V}$, $\text{CLK} = 2.4\text{ MHz}$, unless otherwise noted. All minimum and maximum specifications are guaranteed. Typical specifications are not guaranteed.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
PERFORMANCE						
Directionality				Omni		
Sensitivity ¹		1 kHz, 94 dB SPL	-29	-26	-23	dBFS
Signal-to-Noise Ratio	SNR		59	60.5		dB
Equivalent Input Noise	EIN			33.5		dB
Frequency Response		100 Hz to 10 kHz	-2	0	+2	dB
		100 Hz to 12 kHz	-3	0	+2	dB
Total Harmonic Distortion	THD	105 dB SPL			3	%
Power Supply Rejection Ratio	PSRR	217 Hz, 100 mV p-p square wave superimposed on $V_{DD} = 1.8\text{ V}$	70	80		dBFS
Maximum Acoustic Input		Peak		120		dB SPL
INPUT CHARACTERISTICS						
Clock	CLK		1		3.25	MHz
Supply Voltage	V_{DD}		1.65	1.8	2.0	V
			2.25	2.5	2.75	V
			3.0	3.3	3.6	V
Supply Current	I_S	Normal mode			650	μA
		Sleep mode			50	μA
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}			V_{DD}		V
Output Voltage Low	V_{OL}			0		V
Polarity				Noninverting ²		

¹ Relative to the rms level of a sine wave with positive amplitude equal to 100% 1s density, and negative amplitude equal to 0% 1s density.

² Positive going (increasing) pressure on the membrane results in an increase in the number of 1s at the output.

TIMING CHARACTERISTICS

Table 2.

Parameter	Description	Min	Max	Unit
Input t_{CLKIN}	Input Clock Period	310	1000	ns
Output t_{1OUTEN}	DATA1 driven after falling clock edge	30		ns
$t_{1OUTDIS}$	DATA1 disable after rising clock edge		20	ns
t_{2OUTEN}	DATA2 driven after rising clock edge	30		ns
$t_{2OUTDIS}$	DATA2 disable after falling clock edge		20	ns

TIMING DIAGRAM

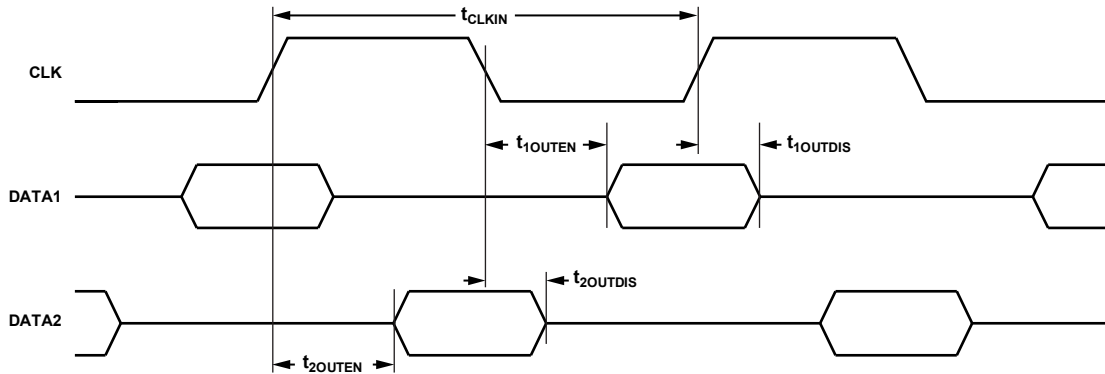


Figure 2. Pulse Density-Modulated Output Timing

07596-005

ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
Supply Voltage	3.6V
Sound Pressure Level (SPL)	160 dB
Mechanical Shock	20,000 g
Vibration	Per Military 883E specification
Temperature Range	-40°C to +85°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

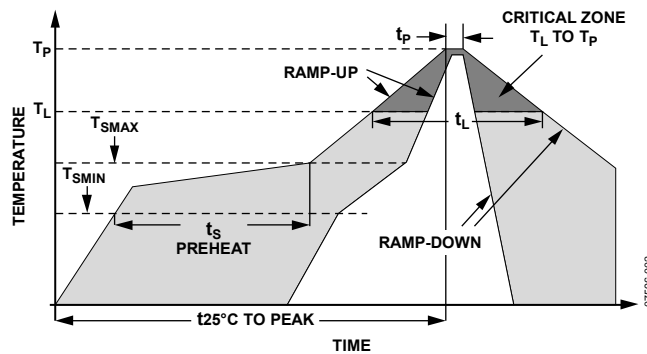


Figure 3. Recommended Soldering Profile

Table 3. Recommended Soldering Profile

Profile Feature	Sn63/Pb37	Pb-Free
Average Ramp Rate (T_L to T_P)	3°C/sec max	3°C/sec max
Preheat		
Minimum Temperature (T_{SMIN})	100°C	150°C
Maximum Temperature (T_{SMAX})	150°C	200°C
Time (T_{SMIN} to T_{SMAX}), t_s	60 sec to 120 sec	60 sec to 120 sec
T_{SMAX} to T_L		
Ramp-Up Rate	3°C/sec	3°C/sec
Time Maintained Above Liquidous (t_L)	60 sec to 150 sec	60 sec to 150 sec
Liquidous Temperature (T_L)	183°C	217°C
Peak Temperature (T_P)	240°C + 0°C/-5°C	260°C + 0°C/-5°C
Time within 5°C of Actual Peak Temperature (t_p)	10 sec to 30 sec	20 sec to 40 sec
Ramp-Down Rate	6°C/sec max	6°C/sec max
Time 25°C to Peak Temperature	6 minute max	8 minute max

TYPICAL PERFORMANCE CHARACTERISTICS

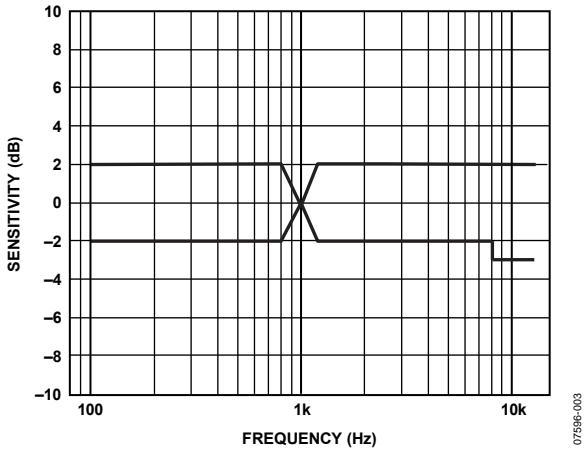


Figure 4. Typical Frequency Response

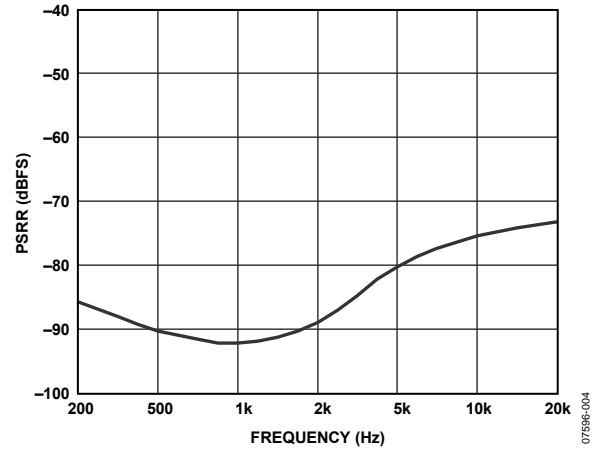


Figure 5. Typical Power Supply Rejection Ratio vs. Frequency

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

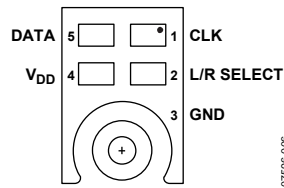


Figure 6. Pin Configuration (Bottom View)

Table 6. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	CLK	Clock Input to Microphone.
2	L/R SELECT	Left Channel or Right Channel Select. DATA1: L/R SELECT tied to GND. DATA2: L/R SELECT pulled to V _{DD} .
3	GND	Ground.
4	V _{DD}	Power Supply.
5	DATA	Digital Output Signal (DATA1, DATA2).

HANDLING INSTRUCTIONS

PICK AND PLACE EQUIPMENT

The MEMS microphone can be handled using standard pick-and-place and chip shooting equipment. Care should be taken 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.
- Use care during pick-and-place to ensure no high shock events above 20 kg are experienced because this may cause damage to the microphone.
- 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 or blow air into the microphone port.
- Do not use excessive force to place the microphone on the PCB.

REFLOW SOLDER

Standard reflow solder conditions specified in Figure 3 can be used to attach the MEMS microphone to the PCB.

BOARD WASH

When washing the PCB, ensure that water does not make contact with the microphone port. Blow-off procedures and ultrasonic cleaning must not be used.

OUTLINE DIMENSIONS

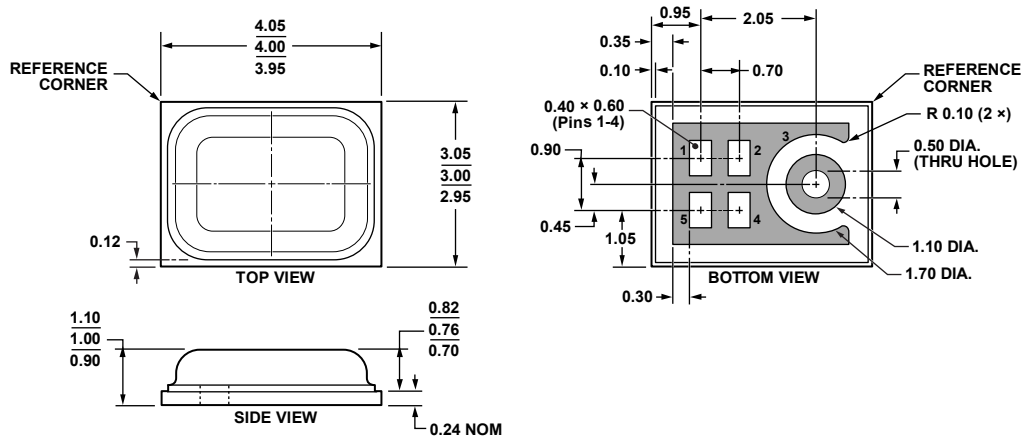
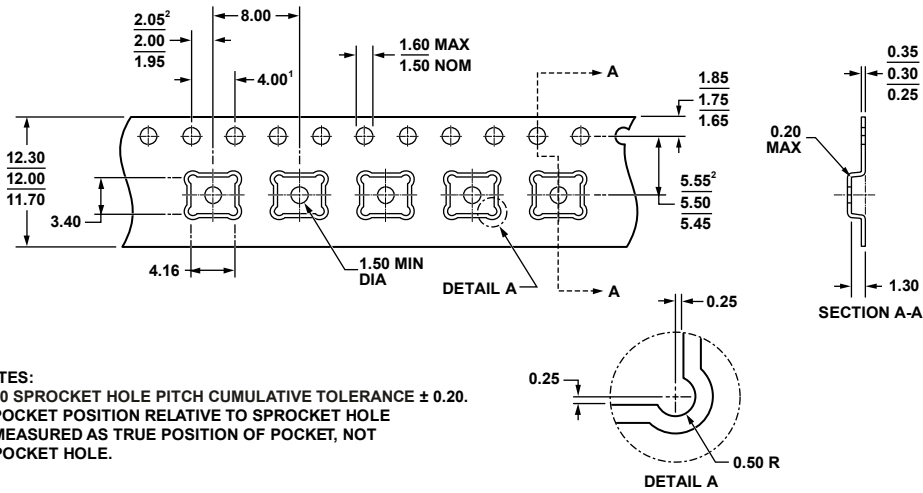


Figure 7. 5-Terminal Chip Array Small Outline No Lead Cavity [LGA_CAV]
4 mm x 3 mm Body
(CE-5-1)
Dimensions shown in millimeters

062508-C



- NOTES:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ± 0.20 .
2. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE.

Figure 8. LGA_CAV Tape and Reel Outline Dimensions
Dimensions shown in millimeters

062408-A

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Ordering Quantity
ADMP421ACEZ-RL ¹	-40°C to +85°C	5-Terminal LGA_CAV, 13" Tape and Reel	CE-5-1	4,000
ADMP421ACEZ-RL7 ¹	-40°C to +85°C	5-Terminal LGA_CAV, 7" Tape and Reel	CE-5-1	1,000

¹ Z = RoHS Compliant Part.

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