

# Omni-directional MEMS Microphone with Top Port and Analog Output

## Features

- Stable sensitivity over power supply range of: 1.5V-3.6V
- Single-ended analog output
- High SNR of 60dBA
- Sensitivity: -42dBV
- High PSRR of 65 dB
- Flat Frequency Response from 100 Hz to 15 kHz
- Low current consumption of <200uA
- 3.76mmX2.95mmX1.1mm surface-mount package
- Compatible with Sn/Pb and Pb-free solder processes

## Applications

- Mobile phones
- Teleconferencing systems
- Digital video cameras
- Bluetooth headsets
- Tablets
- Other electronic devices with audio input

## Description

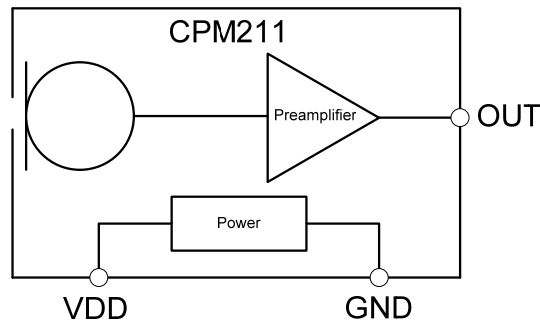
The CPM211 is a high quality, low cost, low power analog output top-ported omni-directional MEMS microphone. CPM211 consists of a MEMS microphone element and an output amplifier (preamplifier). The CPM211 sensitivity specification makes it an excellent choice for both near field and far field applications. The CPM211 has a high SNR and flat wideband frequency response, resulting in natural sound with high intelligibility. Low current consumption enables long battery life for portable applications. Due to the built-in filter, the CPM211 shows high immunity to EMI.

The CPM211 is available in a thin 3.76mmX2.95mmX1.1mm surface mount package. It is reflow solder compatible with no sensitivity degradation. The CPM211 is halide free.



**Fig 1 Pin Configuration of CPM211**

## Block Diagram



**Fig 2 Function Block Diagram**

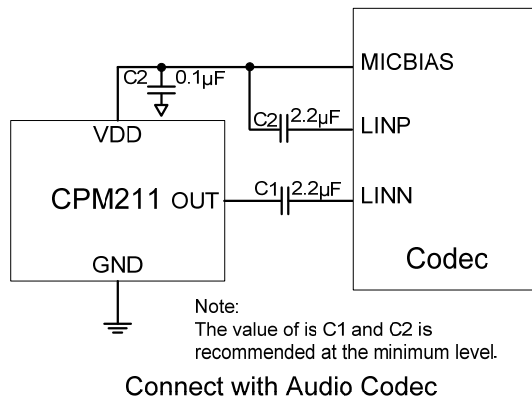
## Pin Definition

No.	Symbol	Description
1	VDD	Power supply
4	OUT	Analog output signal
2,3	GND	Ground

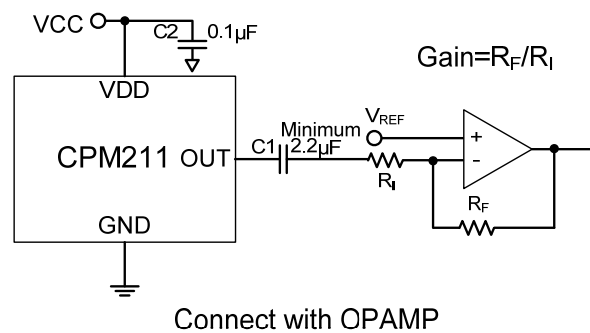
**Note:** Top metal cover is connected to GND.

## Typical Application

The CPM211 output can be connected to a codec microphone input or to a high input impedance gain stage. A DC-blocking capacitor is required at the output of the microphone.



**Fig 3 CPM211 Typical Application 1**



**Fig 4 CPM211 Typical Application 2**

## Ordering Information

Order Number	RoHS	Marking	Packing type
CPM211	Yes	CL11 LLL <sup>1</sup>	5,000 pcs per Reel

1: "LLL" stands for lot number

## Absolute Maximum Ratings (1)

Parameter	Unit
VDD to Ground Voltage	-0.5V to 4 V
Sound pressure level	160dB
Mechanical Shock	10kg
Vibration	Per MIL-STD-883 Method 2007, Test Condition B
Operating Temperature Range	-40°C ~ +70°C

**Note 1:** Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied.

## Electro-Static Discharge Sensitivity



This integrated circuit can be damaged by ESD. It is recommended that all integrated circuits be handled with proper precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure.

## Specifications

Test Condition:  $T_A = +25^\circ\text{C}$ ,  $V_{DD} = +1.8\text{V}$  (unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	Units
<b>Performance</b>						
Directivity				Omni		
Sensitivity		1KHz, 94dB SPL	-45	-42	-39	dBV
Signal-to-Noise-Ratio	SNR			60		dB
Equivalent Input Noise	EIN			36		dBa SPL
Total Harmonic Distortion	THD	105dB SPL			3	%
Power Supply Rejection Ratio	PSRR	217Hz, 100mV $V_{P-P}$ Square wave on $V_{DD}$		65		dB
Maximum Acoustic Input				120		dB SPL
<b>Power supply</b>						
Supply Voltage	$V_{DD}$		1.5		3.6	V
Supply Current	$I_{DD}$				200	uA
<b>Output characteristics</b>						
Output Impedance	$Z_{OUT}$			200		$\Omega$
Output DC Offset				0.75		V
Output Current Limit				90		uA

## Typical Performance Characteristics

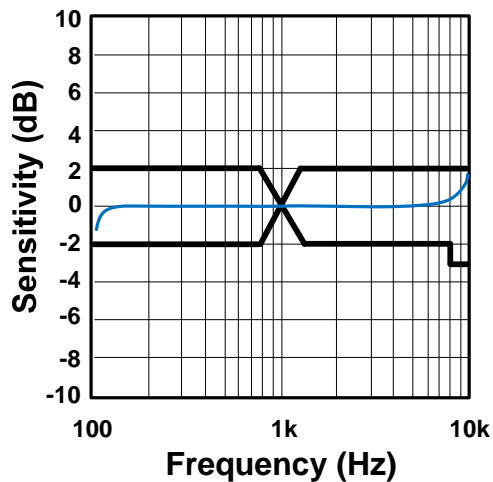


Fig 5 Frequency Response Normalized to 1 kHz.

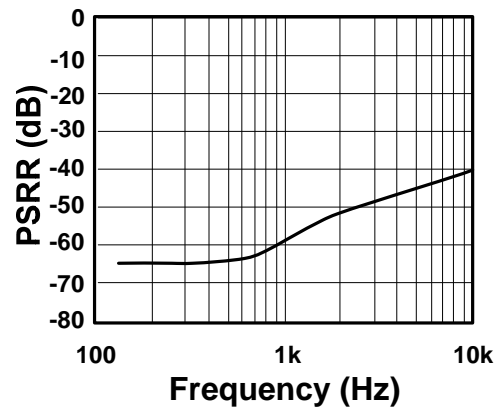


Fig 6 Typical Power Supply Rejection Ratio vs. Frequency

## Reliability Specifications

The microphone sensitivity after stress must deviate by no more than  $\pm 3$ dB from the initial value.

Stress test	Description
Low temperature operation life	-40°C, 500 hours, powered
High temperature operation life	+125°C, 500 hours powered
Total Harmonic Distortion (THD)	+65°C/85% relative humidity, 500 hours, powered
Temperature Cycle	-40°C/+125°C, one cycle per hour, 100 cycles.
High Temperature Storage	+150°C, 500 hours.
Low Temperature Storage	-40°C, 500 hours.
Electrostatic Discharge (ESD)	3 discharges at +/-8kV direct contact to the lid when unit is grounded (IEC 61000-4-2) and 3 discharges at +/-2kV direct contact to the I/O pins (MIL 883E, Method 3015.7).

## Application Information

### Connect to analog device

As an analog MEMS microphone, the CPM211 output can be connected to a dedicated codec microphone input (see Fig 3) or to a high input impedance gain stage (see Fig 4). A 0.1 $\mu$ F ceramic capacitor placed close to the VDD pin of CPM211 is recommended to adequately decouple the microphone from noise on the power supply. A DC-blocking capacitor is required at the output of the microphone. This capacitor creates a high-pass filter with a corner frequency at

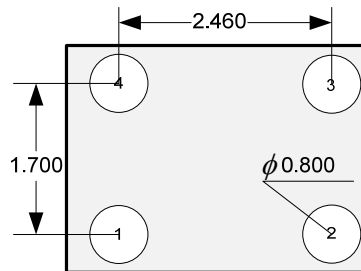
$$f_c = \frac{1}{(2\pi RC)} \quad (1)$$

where R is the input impedance of the codec, C is the DC-blocking capacitor.

A minimum value of 2.2 $\mu$ F is recommended in Fig 3 because the input impedance of the most codec can be as low as 2k $\Omega$  at its highest PGA gain setting, which results in a high-pass filter corner frequency at about 37Hz. Fig 4 shows the CPM211 connect to the op amp configured as a non-inverting preamplifier.

### PCB land pattern layout

The recommended PCB land pattern for the CPM211 should have a 1:1 ratio to the solder pads on the microphone package. Care should be taken to avoid applying solder paste to the sound hole in PCB. The dimensions of suggested solder paste pattern refer to the land pattern.



**Fig 7 Recommended PCB Land Pattern Layout (Units: mm)**

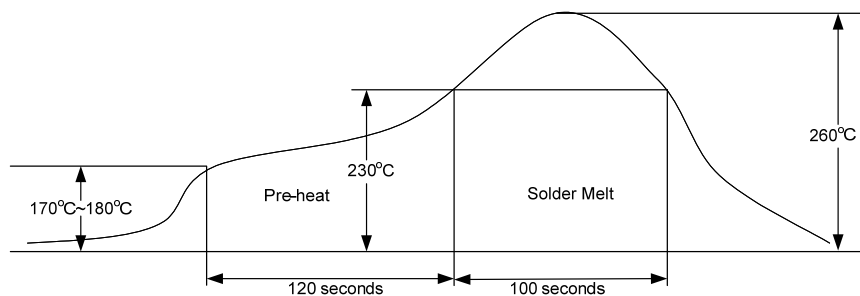
### Pick and place equipment

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 top of the package, the pickup tool can make contact with none-ported part of the lid surface.
- Use care during pick-and-place to ensure that no high shock events above 10 kg are experienced because such events may cause damage to the microphone.
- Do not pick up the microphone with a vacuum tool that makes contact with the top side of the microphone.
- Do not use excessive force to place the microphone on the PCB

### Reflow soldering profile

For best results, the soldering profile should be in accordance with the recommendations of the manufacturer of the solder paste used to attach the MEMS microphone to the PCB. It is recommended that the solder reflow profile not exceed the limit conditions specified in Fig 8.



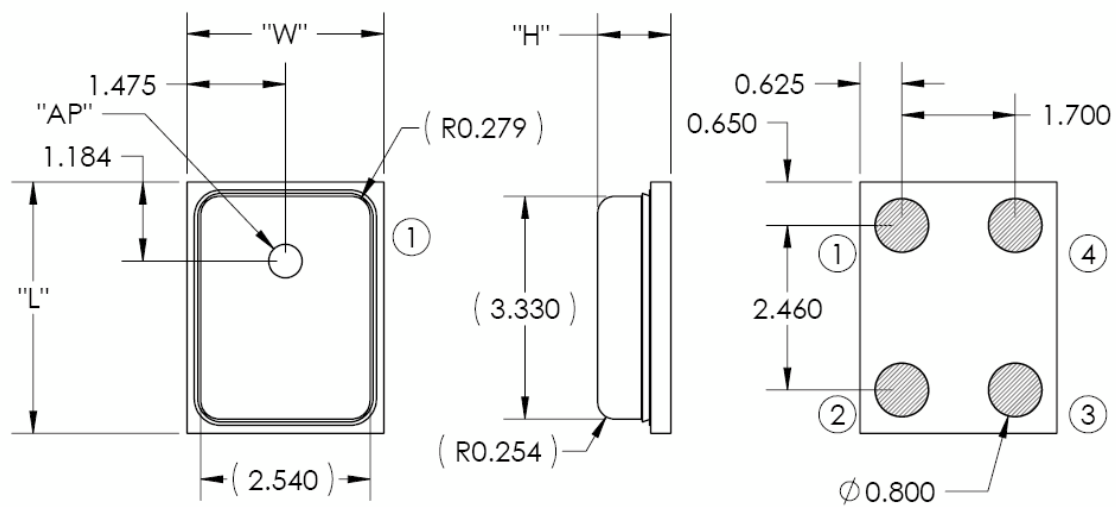
**Fig 8 Recommended Soldering Reflow Profile**

Stage	Temperature profile	Time (Maximum)
Pre-heat	+170°C ~ +180°C	120 sec
Solder melt	>230°C	100 sec
Peak	+260 °C maximum	30 sec

### 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.

### Package Description



**Fig 9 Mechanical Specification (Units: mm)**

Item	Dimension	Tolerance	Unit
Length (L)	3.760	±0.100	mm
Width (W)	2.950	±0.100	mm
Height (H)	1.100	±0.100	mm
Acoustic Port (AP)	Ø0.250	±0.076	mm

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