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The topic of this thesis is the design of CMOS preamplifiers for condenser microphones. Increasingly popular type of condenser microphones are MEMS (micro-electro-mechanical) microphones which pose a stringent requirements to the design of interface electronics among other due to their increased noise. Besides that, as MEMS microphones are easy to integrate with CMOS circuitry, CMOS circuit design gains importance because it can contribute to the overall improved performance of the system by introducing extra functionalities. Possible methods of sensing a signal from the microphone are investigated and explained in the thesis. The method resulting in the overall best performance has been chosen for implementation. Due to the fact that the electronics noise performance is an important factor for minimization of the overall noise of the system, with 1/f noise dominant at low frequencies and increasing with CMOS technology shrinking, the investigation of 1/f noise in CMOS has been done and is explained along with measurement results in the second part of the thesis. In the third part, the knowledge about transistor noise previously obtained has been applied to a problem of noise optimization of a CMOS interface for a capacitive sensor. Finally, in the fourth part, a novel preamplifier designed demonstrating a concept of differential operation of two microphones biased with voltages of opposite polarities has been described. The amplifier shows how accompanying electronic circuitry can be used to enhance performance of MEMS microphones. A new enhanced performance microphone chip-scale package (CSP) with two microphone dies and the CMOS amplifier has been assembled being the microphone with several dB higher signal-to-noise-ratio comparing to existing microphone products on the market. Due to the compact packaging it occupies a small area as well.

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