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Design of an Analog Front End for a Bio-Inspired Auditory Sensor of a Novel Totally Implantable Cochlear Implant

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In this paper, we present a low-power and low-noise analog front end for a totally implantable cochlear implant using a bio-inspired auditory sensor. We used the "g_m of I_D" method to design an analog front end as the interface to an artificial basilar membrane with reduced flicker and thermal noises and low power consumption. We fabricated an Application-Specific Integrated Circuit (ASIC) chip with an analog front end using a 0.35 μm high-voltage CMOS process, showing a measured gain range of 40.35–62.94 dB with an input-referred noise of 5.32 μVrms at a power consumption of 272 μW per channel. As proof of concept demonstration, we used an analog front end with an artificial basilar membrane sensor, exhibiting an audio signal transduction suitable for a biomimetic artificial cochlear implant.

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