

A Low Power-Area Low Pass G m -C Filter in Biomedical Analog Front End for Biosignal Acquisition

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Abstract

In this paper, a low power transconductor-capacitor (Gm-C) filter with programmable cutoff frequency is designed for electroencephalogram (EEG), electrocardiogram (ECG), and surface electromyography (sEMG) biosignals. The second order Butterworth low pass filter (LPF) is designed as an interface between an instrumentation amplifier (IA) and analog to digital converter (ADC). The proposed Gm-C filter suppresses out of band components and also plays anti-aliasing role. With the variable transconductance based on flipped voltage follower (FVF), the cutoff frequencies of 100 Hz, 560 Hz, and 1.5 kHz are obtained for EEG, ECG, and sEMG, respectively. This structure has highly accurate by using a robust and low power common mode feedback (CMFB). With 0.8 V supply voltage, the total power consumption of the filter is only 56 nW, 100 nW, and 221 nW for cutoff frequencies of 100 Hz, 560 Hz, and 1.5 kHz, respectively. The proposed Gm-C filter is simulated in TSMC 65 nm CMOS technology and occupies an area of 0.12 mm². The figure of merit (FOM) of the proposed filter is equal to 1.9 pW/pole.

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