Low Noise Low Power Amplifier for Biomedical Applications

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Abstract

Implementation of EEG signal amplification using low power two stage amplifier. A Bulk Driven Folded Cascode structure is used. The presented amplifier delivers enhanced performance over that of the conventional folded. To reduce the flicker noise PMOS input transistors with large gate area are used. The presented amplifier is simulated in sky130 technology. Biomedical signals have weak amplitude and low frequency so we need to amplify these signals. Amplifiers should have basic features like high CMRR low power consumption low input referred noise for good performance in the field of biomedical engineering.

1 Circuit Details

CMOS technologies paved way to increasing market of mobile and portable electronic devices. This growth is driven by the continual integration of complex analog and digital building blocks on a single chip. The operational transconductance amplifier is an important analog building block and for many applications is the largest and most power consuming. Recently, one of the most commonly used architectures whether as a single-stage or first stage in multistage amplifiers had been the folded cascode amplifier for its high gain and reasonably large signal swing in the present and future low voltage CMOS processes. Biomedical signals have weak amplitude and low frequency so we need to amplify these signals. Amplifiers should have basic features like high CMRR low power consumption low input referred noise for good performance in the field of biomedical engineering.

There are many ways to design the amplifier with above conditions. For example implementation here is two stage gate driven folded cascode amplifier. In addition to reduce the flicker noise PMOS input transistors with large gate areas are used for low power operation. Ib current in M0 Mc1 and Mc3 is mirrored by Mb then M0 supplies the first stage current. M13 and M14 currents are controlled byMc1 and Mc2 .Equal drain potentials is maintained by M13 and M14 across the Ma3 Mb3 and Ma4 Mb4 in order to improve matching. Cc and Rc are used between the drain of M8 and output terminal for compensation, So it improves the phase margin and GBW.

2 Implemented Circuit

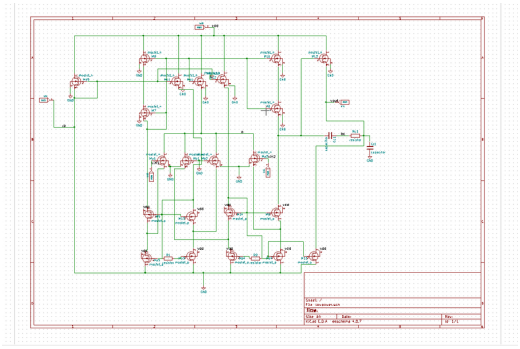

Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

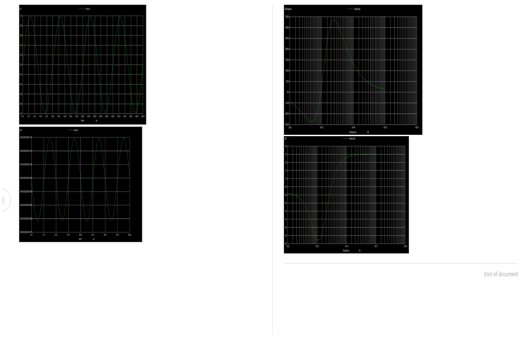

Figure 2: Implemented waveform.

References

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[3] H. F. Baghtash. Design of a low noise low power amplifier for biomedical applications. Design of a Low Noise Low Power Amplifier for Biomedical Applications.