Ultralow power high quality EEG system for ambulatory monitoring

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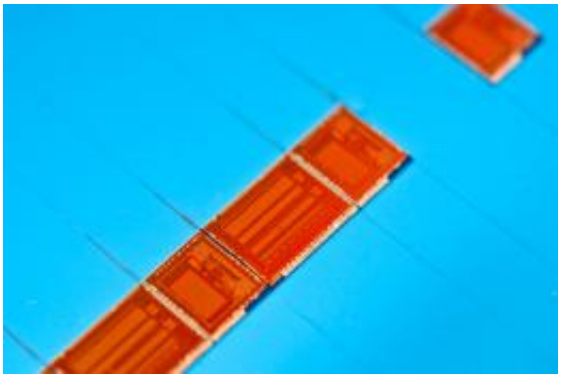

Bare dies of the backend and active electrodes of imec's EEG asic

Today at the VLSI circuits symposium (June 12-15, Honolulu), Imec presents a complete 700µW 8-channel active-electrode (AE)-based EEG monitoring system. The system, developed in collaboration with Panasonic, delivers high quality EEG signals and facilitates ambulatory use and patient comfort.

The complete low-power 8-channel EEG system consists of a set of AEs and a back-end (BE) analog signal processor. It is capable of continuously, while concurrent recording 8 channel EEG signals and electrode-tissue contact impedance (ETI) of the biopotential electrodes. This simultaneous recording enables remote assessment of electrode status during EEG recording. The EEG channels of the system consume less than 87µW (including ETI). The AEs have a gain that relaxes the

noise specifications of the BE and a high input impedance (1.2GΩ at 10Hz) that enables recording from dry electrode. A complete EEG channel, consisting of two AEs and the BE, has high common-mode CMRR (>84dB), and a low noise (1.75μVrms, 0.5-100Hz). These characteristics are essential to extract high quality EEG-signals: μV-range low-frequency signals under a large amount of common-mode (CM) interference.

Imec's EEG acquisition system does not require the use of commercial active components (e.g., bulky instrumentation amplifiers, ADCs etc) in the signal path and delivers a complete solution for digital interfacing. The system is suitable for ambulatory EEG monitoring. Compared to current EEG monitoring systems, ambulatory monitoring increases the patient's autonomy and comfort. The system is also applicable for sports devices, entertainment, comfort monitoring, and other health and lifestyle products and services.

The industry can access this technology by joining imec's Human++ program as research partner or by licensing agreements for further product development. Within the Human++ program, imec and Holst Centre develop solutions for an efficient and better healthcare. Intelligent body area networks with wireless sensors, such as this EEG system, allow ambulatory monitoring of people, which increases the comfort level of patients and is a cost- and time-efficient alternative for current EEG monitoring systems, as well as home monitoring results in daily life measurements that cannot be taken in a clinical environment.

Provided by IMEC