Integrated GFET-on-CMOS biosensing platform with high-resolution and real-time Dirac point tracking

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Melexis presents a novel integrated GFET-on-CMOS biosensing platform, poised to redefine the sensing performance and versatility of GFET-based biosensors.
In GFET biosensing assays, the Dirac point is one of the main indicators of the analyte concentration. It is traditionally tracked by repeatedly measuring the full GFET transfer curves, which is a lengthy process that may cause drift and hysteresis, and requires data post processing. At the heart of Melexis' innovation lies a novel readout architecture designed to offer unprecedented noise and sensitivity compared to classical methods. In this new readout concept, the GFETs are integrated inside a closed-loop system acting as a low pass filter, which can deliver an analog or digital voltage equal to the Dirac voltage. This readout concept provides a fast, high resolution and real-time tracking of the Dirac position without sweeping.
Our platform's versatility is further enhanced by implementing multiple readout modes to accommodate most applications (sweep mode, fixed-bias current mode) in addition to the Dirac tracking modes. Simultaneous and redundant detection of multiple analytes is facilitated by an array of 16x16 GFET pixels that can be individually addressed. Finally, the 3x3mm GFET array can be liquid gated (on-chip gate or external) as well as back gated for gas sensing applications.
Melexis' commitment to pushing the boundaries of biosensing is exemplified by this integrated platform. Through its enhanced performances and multiplexing capabilities, we envision a future where GFET biosensors play a pivotal role in shaping healthcare, diagnostics, and environmental monitoring.

Figures

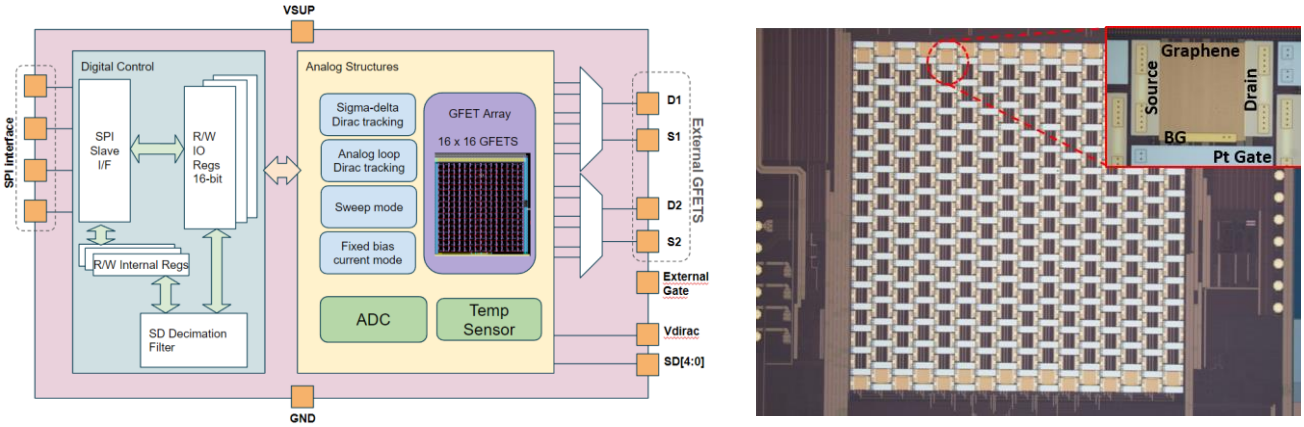

Figure 1 Simplified block diagram of Melexis' integrated biosensor alongside a representative image of the fabricated chip, featuring a 16×16 GFET array (256 pixels) and an inset highlighting a single pixel. The platform includes a digital interface and multiple readout modes, including real-time Dirac tracking.