Session 5 Overview: *Analog Interfaces*

ANALOG SUBCOMMITTEE

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This session highlights advances in state-of-the-art analog interfaces. The first paper describes a power-aware high-performance humidity sensor, followed by an ultra-low-voltage capacitance-to-digital converter without external references. Next, two temperature sensors are presented, one with the most compact size ever reported for hot-spots monitoring, and the other with a high self-calibrated accuracy of up to 0.03°C using a hybrid sensor core. The following two papers report highly-efficient magnetometers for contactless current sensing. The session continues with a high-resolution MEMS Coriolis mass-flow sensor readout. The last paper introduces a high-slew single-stage amplifier for large capacitive loads, showcasing the best figures-of-merit over the state of the art.

8:30 AM

5.1 A 1.5μW 0.135pJ·%RH² CMOS Humidity Sensor Using Adaptive Range-Shift Zoom CDC and Power-Aware Floating Inverter Amplifier Array

Heyi Li, Peking University, Beijing, China

In Paper 5.1, Peking University describes a CMOS humidity sensor that achieves a 0.0094%RH resolution with 1.5μW power consumption, demonstrating a state-of-the-art resolution-FoM of 0.135pJ•%RH².

8:38 AM

5.2 Capacitance-to-Digital Converter for Operation Under Uncertain Harvested Voltage down to 0.3V with No Trimming, Reference and Voltage Regulation

Orazio Aiello, National University of Singapore, Singapore, Singapore

In Paper 5.2, the National University of Singapore presents a capacitance-to-digital converter (CDC) for direct harvester-powered low-cost systems, showing a 7-bit ENOB down to 0.3V at 1.37nW power without any external reference or voltage-regulation requirements.

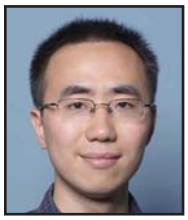
8:46 AM

5.3 A Highly Digital 2210μm² Resistor-Based Temperature Sensor with a 1-Point Trimmed Inaccuracy of ±1.3°C (3σ) from -55°C to 125°C in 65nm CMOS

Jan A. Angevare, Delft University of Technology, Delft, The Netherlands

In Paper 5.3, Delft University of Technology demonstrates a highly digital resistor-based temperature sensor that exhibits a ±1.3°C (3σ) inaccuracy from -55°C to 125°C after a 1-point trimming, while occupying only 2210μm².

8:54 AM



5.4 A Hybrid Thermal-Diffusivity/Resistor-Based Temperature Sensor with a Self-Calibrated Inaccuracy of ±0.25°C (3σ) from −55°C to 125°C

Sining Pan, Delft University of Technology, Delft, The Netherlands

In Paper 5.4, Delft University of Technology introduces a hybrid thermal-diffusivity and resistor-based temperature sensor. It achieves a self-calibrated inaccuracy of ±0.25°C (3σ) from –55°C to 125°C after a 2-point trimming, without requiring any external voltage/temperature references.

9:02 AM

5.5 A 770 kS/s Duty-Cycled Integrated-Fluxgate Magnetometer for Contactless Current Sensing

Preetinder Garcha, Kilby Labs, Texas Instruments, Dallas, TX and Massachusetts Institute of Technology, Cambridge, MA

In Paper 5.5, the Massachusetts Institute of Technology showcases an integrated fluxgate magnetometer for contactless current sensing with a mixed signal front-end design for energy-efficient duty cycled operation. This work achieves 1.67x higher peak BW over prior arts.

9:10 AM

5.6 A 25A Hybrid Magnetic Current Sensor with 64mA Resolution, 1.8MHz Bandwidth, and a Gain Drift Compensation Scheme

Amirhossein Jouyaeian, Delft University of Technology, Delft, The Netherlands

In Paper 5.6, Delft University of Technology reveals a fully integrated hybrid hall+coil sensor for wideband magnetic current-sensing applications. Using an S-shaped lead frame for differential field measurement, it attains a high resolution of 64mA$_{rms}$ at 19.5mW and 1.8MHz BW, corresponding to a state-of-the-art FoM of 22.5.

9:18 AM

5.7 A MEMS Coriolis Mass Flow Sensor with 300µg/h/√Hz Resolution and ±0.8mg/h Zero Stability

Arthur C. de Oliveira, Delft University of Technology, Delft, The Netherlands

In Paper 5.7, Delft University of Technology develops a MEMS Coriolis mass flow sensor suitable for both liquids and gases, featuring a 300µg/h/√Hz resolution and a ±0.8mg/h zero stability while consuming only 14.6mW.

9:26 AM

5.8 A 5V Dynamic Class-C Paralleled Single-Stage Amplifier with Near-Zero Dead-Zone Control and Current-Redistributive Rail-to-Rail G_m-Boosting Technique

Seok-Tae Koh, KAIST, Daejeon, Korea

In Paper 5.8, KAIST reports a rail-to-rail-input high-slew single-stage amplifier that uses a parallel linear OTA and dynamic Class-C amplifier configuration. It demonstrates >100dB DC gain and 0.01-to-0.127MHz GBW over 0.8-to-10nF load with >58.6° phase margin.