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TEXAS A&M UNIVERSITY

S E M I N A R

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by

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A 10Gb/s Hybrid ADC-Based Receiver with Embedded 3-Tap Analog FFE and Dynamically-Enabled Digital Equalization in 65nm CMOS

Abstract: The use of high speed ADC front-ends in serial link receivers allow for the efficient implementation of powerful equalizers in the digital domain, as well as supporting bandwidth-efficient modulation schemes, which enables operation over high attenuation channels at high signaling rates. The power consumption of these ADC front-ends, as well as the subsequent digital equalization, is still a major issue. This work presents a hybrid ADC-based receiver architecture which employ 3-tap analog FFE embedded inside a 6-bit asynchronous SAR ADC and a per-symbol dynamically-enabled digital equalizer. Fabricated in GP 65nm CMOS, the 10Gb/s receiver compensates for up to 36.4dB channel attenuation. Dynamic enabling of the digital 4-tap FFE and 3-tap DFE on a per-symbol basis results in 30mW savings, and an overall receiver power less than 90mW.

Ayman Shafik received the B.Sc. and M.Sc. degrees in electrical engineering from Ain-Shams University, Cairo, Egypt, in 2005 and 2009, respectively. During 2010, he was a design intern with Broadcom Corporation, Irvine, CA. During 2012, he was a design intern with Rambus Inc., Sunnyvale, CA. He is currently working towards his Ph.D. degree in integrated circuits and systems at Texas A&M University, College Station, TX.

A 0.45-to-3V Reconfigurable Charge-Pump Energy Harvester with Two-Dimensional MPPT for Internet of Things

Abstract: Compared with inductive DC-DC boost converters, the charge pump (CP) features no off-chip inductors and is suitable for monolithic low power energy harvesting applications such as Internet of Things (IoT) smart nodes. However, the single-conversion ratio (CR) CP has a narrow input voltage range, which induces a charge redistribution loss (CRL) and becomes a bottle-neck preventing highly efficient energy harvesting. The proposed charge pump energy harvester for IoT smart nodes dynamically reconfigures its conversion ratio, and acts as a part of the two-dimensional MPPT with switching frequency tuning. Such a topology simultaneously achieves wide input range for various energy sources from 0.45-to-3V and a flattened efficiency as high as 89%. For the low power scenario of IoT, the detailed MPPT sensing is conducted in voltage-domain by peak value comparison and constant on-time control.

Xiaosen Liu (S'08) was born in Jiangsu Province, China, in 1985. He received the B.Sc. and M. Phil. degrees in electrical engineering from Southeast University, Nanjing, China, and Hong Kong University of Sci & Tech (HKUST), Hong Kong, in 2008, and 2011, respectively. He is currently working toward the Ph.D. degree in electrical and computer engineering at Texas A&M University, College Station. From 2008 to 2011, he worked in the Nanoelectronics Fabrication Facility (NFF) as a process development scientist for compound semiconductors, where he was involved with the development of GaN E/D-HEMT mixed signal circuits. His research interests include green energy harvesting system, smart power management systems, RF integrated circuits (RFIC) design, and application circuits for compound semiconductor.