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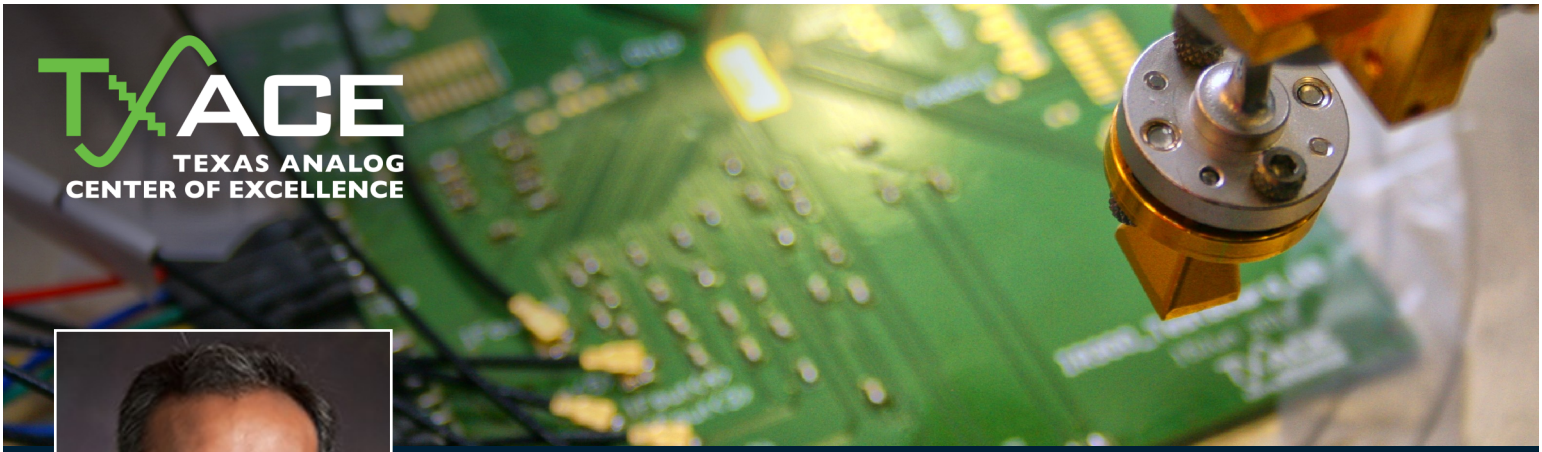

Highly Stable On-Chip Frequency References

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BIO

Pavan Hanumolu is a Professor in the Department of Electrical and Computer Engineering at the University of Illinois, Urbana-Champaign. He received a Ph.D. degree from the School of Electrical Engineering and Computer Science at Oregon State University in 2006, where he subsequently served as a faculty member till 2013. Dr. Hanumolu' research interests are in energy-efficient integrated circuit implementation of analog and digital signal processing, frequency references, wireline communication systems, and power conversion. He is the current Editor-in-Chief of the IEEE Journal of Solid-State Circuits and an IEEE Fellow.

ABSTRACT

Stable frequency references serve many vital purposes, such as timekeeping for calendar functions and reference clock for radios and micro-controllers. While quartz crystal-based references can achieve the desired performance, they are bulky, expensive, and suffer from long start-up time. Hence, techniques for implementing fully integrated frequency references that are energy efficient and can achieve excellent frequency stability across a wide temperature/voltage range are needed. In this talk, I will present methods for improving the frequency accuracy of RC oscillators using precise cancellation of the resistor TC across PVT. I will show robust compensation can be achieved using a parallel combination of switched-resistors that are digitally controlled by pulse-density modulated sequences. Finally, I will present experimental results obtained from prototype oscillators fabricated in a 65nm CMOS process and use them to illustrate that reducing the inaccuracy to better than 150ppm (2.1ppm/◦C) is feasible without compromising long-term stability (2.5ppm Allan deviation) and power efficiency (1μW/MHz).

Friday, July 23, 2021 at 1:00 – 2:00 p.m.
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