

Commercialization Experience of Fabless Infrared CMOS Microbolometers and Other Innovative MEMS and Semiconductor Products

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This talk will present the start-up experience, R&D progress, and business model of the fabless semiconductor and MEMS companies that are established as spin-off/start-up companies from METU-MEMS Center. The talk will highlight Mikrosens that has developed cost-effective, patented, CMOS-based MEMS uncooled microbolometer infrared sensors for a wide range of infrared imaging applications, including automotive, security, machine vision, and consumer electronics. Unlike current approaches of competitors that require expensive and complex processes at dedicated fabs, Mikrosens' CMOS microbolometer is developed to be truly fabless and to be produced at any standard CMOS and/or MEMS foundry, leading to cost advantage, simplicity, and flexibility. Mikrosens's CMOS microbolometer approach does not require special high TCR materials and allows to use wafer level vacuum packaging technologies of high volume CMOS/MEMS foundries, such as AIGe. The talk will also highlight another fabless company, Mikro-Tasarim, which has developed high-performance Readout Integrated Circuits (ROICs) and their driver/digitizer ASICs for hybrid/monolithic, cooled/uncooled detectors in UV, Visible, NIR, SWIR, MWIR, and LWIR wavelengths. To highlight its capabilities, its CTIA ROICs for SWIR FPAs will be introduced, as these ROICs show a read noise performance of 5-e, which is about an order of magnitude smaller than the state-of-the-art counter parts in the world market. The talk will also summarize the other spin-off companies established based on the research achievements of METU-MEMS Center, including gyroscopes showing performances below 1degree/hour, accelerometers showing performances below 10ug with above 130dB dynamic range, RF MEMS switches operating above 12 billion cycles, and innovative and patented BioMEMS devices for cancer cell detection and for cochlear implants.



Figure: Developed IR chip and module.

Biography



Tayfun Akin was born in Van, Turkey, in 1966. He received the B.S. (Hons.) degree from Middle East Technical University (METU), Ankara, in 1987, and the M.S. and Ph.D. degrees from the University of Michigan, Ann Arbor, in 1989 and 1994, respectively, all in electrical engineering. He went to USA in 1987 for his graduate studies with a graduate fellowship provided by the NATO Science Scholarship Program through the Scientific and Technical Research Council of Turkey. Since 1995, 1998, and 2004, he has been an Assistant Professor, an Associate Professor, and a Professor, respectively, with the Department of Electrical and Electronics Engineering, METU. He is currently the Director of the METU–Microelectromechanical Systems (MEMS) Center. He raised and managed over U.S. \$65 million in funding for several national and international projects, including EU FP6, FP7, NATO SfS, and NSF–USA Projects. His current research interests include MEMS, microsystems technologies, uncooled infrared detectors and readout circuits, inertial microsensors, silicon-based integrated sensors and transducers, and analog and digital

integrated circuit design. He was a recipient of the First Prize in Experienced Analog/Digital Mixed-Signal Design Category at the 1994 Student VLSI Circuit Design Contest organized and sponsored by Mentor Graphics, Texas Instruments, Hewlett-Packard, Sun Microsystems, and Electronic Design Magazine. He has co-authored the Symmetric and Decoupled Gyroscope project, which received the First Prize Award in the operational designs category of the International Design Contest organized by the DATE Conference and CMP in 2001. He has also co-authored the Gyroscope project, which received the Third Prize Award of the 3-D MEMS Design Challenge organized by MEMGen Corporation (currently, Microfabrica). He has served various MEMS, EUROSENSORS, and TRANSDUCERS Conferences, as a Technical Program Committee Member. He was the Co-Chair of the 19th IEEE International Conference of MEMS 2006, held in Istanbul, and he was the Co-Chair of the Steering Committee of the IEEE MEMS Conference in 2007. He is the Steering Committee Member of the 18th International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers 2015).