

2018 14th Conference on Ph.D. Research in Microelectronics and Electronics (PRIME 2018)

**Prague, Czech Republic
2-5 July 2018**



**IEEE Catalog Number: CFP18622-POD
ISBN: 978-1-5386-5388-3**

**Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18622-POD
ISBN (Print-On-Demand):	978-1-5386-5388-3
ISBN (Online):	978-1-5386-5387-6

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

Table of Contents

Welcome	xiii
Committees	xv
Company Fair	xix
Social Events	xxi
Plenaries	xxiii
Regular Papers	
Session: Analog Circuits I	
Improved Class-AB Output Stage for Sub-1-V Fully-Differential Operational Amplifiers <i>A. Ría, S. Del Cesta, A. Catania, M. Piotto, P. Bruschi</i> University of Pisa, Italy	1
A Fully-Differential, 200-MHz, Programmable Gain, Level-Shifting, Hybrid Amplifier/Power Combiner/Test Buffer, Using Pre-Distortion for Enhanced Linearity <i>V. Kampus¹, T. Rang¹, D. Knaller², C. Fleischhacker², M. Korak², J. Kiss²</i> ¹ Tallinn University of Technology, Estonia, ² Intel, Austria	5
New Resistor-Free Current Mode Wheatstone Bridge Topologies with Intrinsic Linearity <i>L. Safari, G. Barile, V. Stornelli, G. Ferri, A. Leoni</i> University of L'Aquila, Iran	9
A Fully Differential Charge-Sensitive Amplifier for Dust-Particle Detectors <i>S. Kelz, T. Veigel, M. Grözing, M. Berroth</i> University of Stuttgart, Germany	13
A ZTC-based 0.5-V CMOS Voltage Reference <i>Y. Wenger, B. Meinerzhagen</i> TU Braunschweig, Germany	17
Session: Data Converters	
Generalization of Reference-Less Timing Mismatch Calibration Methods for Time-Interleaved ADCs <i>A. Uran, M. Kilic, Y. Leblebici</i> EPFL, Switzerland	21
A 6.5-CE°W 70-dB 0.18-CE°m CMOS Potentiostatic Delta-Sigma for Electrochemical Sensors <i>J. Aymerich, M. Dei, L. Terés, F. Serra-Graells</i> IMB-CNM (CSIC), Spain	25

11.7-Bit Time-to-Digital Converter with 0.82-ps Resolution in 130-nm CMOS Technology <i>R. Granja¹, M. Santos¹, J. Guilherme², N. Horta³</i> ¹ Instituto de Telecomunicações, Portugal, ² Instituto Politécnico de Tomar, Portugal, ³ Instituto Superior Técnico Lisboa, Portugal	29
A High-Resolution Δ-Modulator ADC with Oversampling and Noise-Shaping for IoT <i>A. Correia¹, P. Barquinha¹, J. Marques², J. Goes¹</i> ¹ Universidade NOVA de Lisboa, Portugal, ² S3 Semiconductors, Portugal	33
A 12.4-fJ-FoM 4-Bit Flash ADC Based on the Strong-Arm Architecture <i>A. Almansouri, A. Alturki, H. Fariborzi, K. Salama, T. Al-Attar</i> King Abdullah University of Science and Technology, Saudi Arabia	37
Session: Modeling, Optimization, and Characterization	
A Low-Power Voice Activity Detector for Portable Applications <i>G. Meoni, L. Pilato, L. Fanucci</i> University of Pisa, Italy	41
Fractional-Order Hartley Oscillator <i>A. Agambayev¹, A. Kartci², A. Hassan¹, N. Herencsar², H. Bagci¹, K. Salama¹</i> ¹ King Abdullah University of Science and Technology, Saudi Arabia, ² Brno University of Technology, Czech Republic	45
System-Level Simulation Framework for the ASICs Development of a Novel Particle Physics Detector <i>A. Caratelli¹, S. Scarfi¹, D. Ceresa², K. Kloukinas², Y. Leblebici¹</i> ¹ EPFL, Switzerland, ² CERN, Switzerland	49
A Bayesian Indicator for Run-to-Run Performance Assessment in Semiconductor Manufacturing <i>T. Korabi^{1, 3}, G. Graton^{2, 3}, E. El Adel³, M. Ouladsine³, J. Pinaton¹</i> ¹ STMicroelectronics, France, ² Ecole Centrale Marseille, France, ³ University of Aix-Marseille, France	53
UTBB FD-SOI Circuit Design Using Multi-Finger Transistors: A Circuit-Device Interaction Perspective <i>A. Sharma¹, N. Alam², A. Bulusu¹</i> ¹ Indian Institute of Technology Roorkee, India, ² Aligarh Muslim University, India	57
Let's Make it Noisy: A Simulation Methodology for Adding Intrinsic Physical Noise to Cryptographic Designs <i>K. Nawaz, L. Van Brandt, F. Standaert, D. Flandre</i> KU Leuven, Belgium	61
Session: Circuits for Memories and Security	
Analysis on Sensing Yield of Voltage Latched Sense Amplifier for Low Power DRAM <i>S. Kim, B. Song, T. Oh, S. Jung</i> Yonsei University, South Korea	65
The Key Impact of Incorporated Al₂O₃ Barrier Layer in W-Based ReRAM Switching Performance <i>E. Shahrabi¹, C. Giovinozzo², J. Sandrini¹, Y. Leblebici¹</i> ¹ EPFL, Switzerland, ² Politecnico di Torino, Italy	69
A Variability-Aware Analysis and Design Guideline for Write and Read Operations in Cross-point STT-MRAM Arrays <i>Y. Belay, A. Cabrini, G. Torelli</i> University of Pavia, Italy	73

A Simulated Approach to Evaluate Side Channel Attack Countermeasures for the Advanced Encryption Standard	
<i>L. Sarti, L. Baldanzi, L. Crocetti, B. Carnevale, L. Fanucci</i>	
University of Pisa, Italy	77
Enabling Secure Boot Functionality by Using Physical Unclonable Functions	
<i>K. Müller, R. Ulrich, A. Stanitzki, R. Kokozinski</i>	
Fraunhofer IMS Duisburg, Germany	81
Encryption of Test Data: Which Cipher is Better?	
<i>M. Da Silva, E. Valea, M. Flottes, S. Dupuis, G. Di Natale, B. Rouzeyre</i>	
LIRMM, France	85
Session: Reliability and Resiliency	
Increasing EM Robustness of Placement and Routing Solutions Based on Layout-Driven Discretization	
<i>S. Bigalke¹, T. Casper², S. Schöps², J. Lienig¹</i>	
¹ TU Dresden, Germany, ² TU Darmstadt, Germany	89
Characterising Soft-Failures in Component-Level ESD Testing	
<i>P. Schrey</i>	
Graz University of Technology, Austria	93
Torus Topology Based Fault-Tolerant Network-on-Chip Design with Flexible Spare Core Placement	
<i>P. Veda Bhanu¹, P. Kulkarni¹, J. Soumya¹, L. Cenkeramaddi², H. Idsøe²</i>	
¹ BITS-PILANI Hyderabad, India, ² University of Agder, Norway	97
Design and Analysis of Energy-Efficient Self-Correcting Latches Considering Metastability	
<i>C. Indra Kumar, A. Bulusu</i>	
Indian Institute of Technology Roorkee, India	101
Session: Power Circuits and Harvesting	
A CMOS Gate Driver with Ultra-Fast dV/dt Embedded Control Dedicated to Optimum EMI and Turn-On Losses Management for GaN Power Transistors	
<i>P. Bau^{1, 2}, M. Cousineau¹, B. Cougo², F. Richardeau¹, D. Colin³, N. Rouger¹</i>	
¹ University of Toulouse, France, ² IRT Saint Exupéry, France, ³ Association des industriels PRIMES, France	105
Design of a SIBO DC-DC Converter for AMOLED Display Driving	
<i>F. Boera, A. Salimath, E. Bonizzoni, F. Maloberti</i>	
University of Pavia, Italy	109
A Human Body Powered Sensory Glove System Based on Multi-Source Energy Harvester	
<i>A. Leoni¹, V. Stornelli¹, G. Ferri¹, V. Errico², M. Ricci², A. Pallotti², G. Saggio²</i>	
¹ University of L'Aquila, Italy, ² University of Roma Tor Vergata, Italy	113
HW Platform for BMS Algorithm Validation	
<i>L. Buccolini, F. Garbuglia, M. Unterhorst, M. Conti</i>	
Università Politecnica delle Marche, Italy	117
Session: Analog Circuits II	
Ultra Low Frequency Low Power CMOS Oscillators for MPPT and Switch Mode Power Supplies	
<i>F. Galea, O. Casha, I. Grech, E. Gatt, J. Micallef</i>	
University of Malta, Malta	121

Analysis of Gain and Bandwidth Limitations of Operational Amplifiers in Sigma-Delta Modulators	
<i>T. Saalfeld, A. Meyer, E. Schulte Bocholt, R. Wunderlich, S. Heinen</i>	
RWTH Aachen University, Germany	125
Design of a Low-Power Ultrasound Transceiver for Underwater Sensor Networks	
<i>G. Berkol, P. Baltus, P. Harpe, E. Cantatore</i>	
Eindhoven University of Technology, Netherlands	129
On the Design of a Linear Delay Element for the Triggering Module at CERN LHC	
<i>J. Gauci¹, E. Gatt¹, O. Casha¹, G. De Cataldo², I. Grech¹, J. Micallef¹</i>	
¹ University of Malta, Malta, ² INFN Bari, Italy	133
Session: Radio Frequency Circuits and Systems I	
A 4-W 37.5-42.5-GHz Power Amplifier MMIC in GaN on Si Technology	
<i>F. Costanzo, R. Giofrè, A. Salvucci, G. Polli, E. Limiti</i>	
University of Roma Tor Vergata, Italy	137
An Integrated Power Detector for a 5-GHz RF PA	
<i>V. Qunaj, U. Celik, P. Reynaert</i>	
KU Leuven, Belgium	141
Design of an E-Band Doherty Power Amplifier	
<i>M. Najmussadat¹, R. Ahamed¹, D. Parveg², M. Varonen², K. Halonen¹</i>	
¹ Aalto University, Finland, ² VTT Technical Research Centre of Finland, Finland	145
A Novel Multi-level CMOS Switching Mode Amplifier for Mobile Communication Signals	
<i>R. Bieg, M. Schmidt, M. Grözing, M. Berroth</i>	
University of Stuttgart, Germany	149
Down-Converter Solutions for 77-GHz Automotive Radar Sensors in 28-nm FD-SOI CMOS Technology	
<i>C. Nocera¹, A. Cavarra¹, G. Papotto², E. Ragonese¹, G. Palmisano¹</i>	
¹ University of Catania, Italy, ² STMicroelectronics, Italy	153
Session: Digital Circuits and Sub-Systems	
A Novel Very Low Voltage Topology to Implement MCML XOR Gates	
<i>D. Bellizia¹, G. Palumbo², G. Scotti¹, A. Trifiletti¹</i>	
¹ University of Roma La Sapienza, Italy, ² University of Catania, Italy	157
VLSI Design of Frequent Items Counting Using Binary Decoders Applied to 8-Bit per Item Case-Study	
<i>K. Inoue¹, T. Hoang², X. Nguyen², H. Nguyen², C. Pham²</i>	
¹ Advanced Original Technologies, Japan, ² University of Electro-Communications, Japan	161
Multi-Stage Complex Notch Filtering for Interference Detection and Mitigation to Improve the Acquisition Performance of GPS	
<i>S. Arif, A. Coskun, I. Kale</i>	
University of Westminster, United Kingdom	165
Stall-Aware Fixed-Point Implementation of LMS Filters	
<i>D. Esposito, G. Di Meo, D. De Caro, E. Napoli, N. Petra, A. Strollo</i>	
University of Napoli Federico II, Italy	169
A Space-Fibre Multi-Lane CODEC System-on-a-Chip: Enabling Technology for Low-Cost Satellite EGSE	
<i>P. Nannipieri¹, G. Dinelli¹, D. Davalle², L. Fanucci¹</i>	
¹ University of Pisa, Italy, ² IngeniArs, Italy	173

Design and Implementation of a Complete Test Equipment Solution for Space-Wire Links <i>A. Marino, L. Dello Sterpaio, L. Fanucci</i> University of Pisa, Italy	177
Session: Radio Frequency Circuits and Systems II	
A Novel Hybrid Polar-I/Q Modulation Method Relaxing RF Phase Modulator Design Requirements <i>T. Buckel¹, P. Preyler¹, E. Hager¹, T. Mayer¹, S. Tertinek¹, A. Springer², R. Weigel³</i> ¹ Intel, Austria, ² University of Linz, Austria, ³ University of Erlangen-Nuremberg, Austria	181
A Sub-1V, 72-CE°W Stacked LNA-VCO for Wireless Sensor Network Applications <i>E. Kargaran, D. Manstretta, R. Castello</i> University of Pavia, Italy	185
Low-Power Locking Detector for Frequency Calibration of Multi-Frequency Injection Locked Oscillators <i>A. Boulmirat, C. Jany, A. Siligaris, J. Gonzalez Jimenez</i> CEA-TECH, France	189
A Novel True Logarithmic Amplifier in 0.25-μm GaN on SiC Technology for Radar Applications <i>A. Salvucci, M. Vittori, S. Colangeli, G. Polli, E. Limiti</i> University of Roma Tor Vergata, Italy	193
Ka-/V-Band Self-Biased LNAs in 70-nm GaAs/InGaAs Technology <i>G. Polli, M. Vittori, W. Ciccognani, S. Colangeli, F. Costanzo, A. Salvucci, E. Limiti</i> University of Roma Tor Vergata, Italy	197
Single MMIC Receivers for C-band T/R Module in 0.25-μm GaN Technology <i>A. Salvucci, G. Polli, A. De Padova, S. Colangeli, F. Costanzo, W. Ciccognani, E. Limiti</i> University of Roma Tor Vergata, Italy	201
Session: Sensing and Biomedical Circuits I	
Decreasing the Actuation Voltage in Electrowetting on Dielectric with Thin and Micro-Structured Dielectric <i>S. Türk¹, E. Verheyen¹, R. Viga¹, S. Allani², A. Jupe², H. Vogt²</i> ¹ University of Duisburg-Essen, Germany, ² Fraunhofer IMS Duisburg, Germany	205
Exploiting Non-Linearities to Improve the Linear Region in an Electrostatic MEMS Demodulator <i>J. Scerri, B. Portelli, I. Grech, E. Gatt, O. Casha</i> University of Malta, Malta	209
Multi-Channel Electrotactile Stimulation System for Touch Substitution: A Case Study <i>H. Fares¹, L. Seminara¹, H. Chible², S. Dosen³, M. Valle¹</i> ¹ University of Genova, Italy, ² Lebanese University, Lebanon, ³ Aalborg University, Denmark	213
Modeling of a Capacitive Sensor Dedicated to Drug Injection <i>S. Joly¹, A. Lepple-Wienhues¹, C. Dehollain²</i> ¹ Valtronic Technologies, Switzerland, ² EPFL, Switzerland	217
Lock-In Based Differential Front-End for Raman Spectroscopy Applications <i>A. Ragni, G. Ferrari, G. Sciortino, M. Sampietro, D. Polli, V. Kumar, F. Crisafi</i> Politecnico di Milano, Italy	221
Session: Automotive Circuits and Systems	
Electric Vehicle Battery Management System Using Power Line Communication Technique <i>A. Pake¹, W. Pribyl², G. Hofer¹</i> ¹ Infineon Technologies, Austria, ² Graz University of Technology, Austria	225

Evaluation of Front-End Readout Circuits for High Performance Automotive MEMS Accelerometers

A. Lanniel¹, T. Alpert¹, T. Boeser¹, M. Ortmanns²

¹Bosch, Germany, ²University of Ulm, Germany

229

Real-Time Defect Detection of Wheel Bearing by Means of a Wirelessly Connected Microphone

E. Raviola, F. Fiori

Politecnico di Torino, Italy

233

Multi-Object Detection in Direct Time-of-Flight Measurements with SPADs

J. Haase, M. Beer, J. Ruskowski, H. Vogt

Fraunhofer IMS Duisburg, Germany

237

Session: Sensing and Biomedical Circuits II

Super-Capacitors for Implantable Medical Devices with Wireless Power Transmission

P. Mendoza Ponce, B. John, D. Schroeder, W. Krautschneider

TU Hamburg-Harburg, Germany

241

Design and Modelling of a Super-Regenerative Receiver for Medical Implant Devices

N. Pekçokgüler¹, G. Dündar¹, C. Dehollain²

¹Bogazici University, Turkey, ²EPFL, Switzerland

245

A Fully Fail-Safe Capacitive-Based Charge Metering Method for Active Charge Balancing in Deep Brain Stimulation

R. Ranjandish¹, O. Shoaee², A. Schmid¹

¹EPFL, Switzerland, ²University of Tehran, Iran

249

Current Controlled CMOS Stimulator with Programmable Pulse Pattern for a Retina Implant

P. Raffelberg¹, R. Burkard¹, R. Viga¹, W. Mokwa², P. Walter², A. Grabmaier³, R. Kokozinski³

¹University of Duisburg-Essen, Germany, ²RWTH Aachen University, Germany, ³Fraunhofer IMS Duisburg, Germany

253

A Laser Diode-Based Wireless Optogenetic Headstage

A. Mesri¹, A. Cunha², Ø. Martinsen², M. Sampietro¹, G. Ferrari¹

¹Politecnico di Milano, Italy, ²University of Oslo, Norway

257

An Active Charge Balancing Method Based on Chopped Anodic Phase

R. Ranjandish, A. Schmid

EPFL, Switzerland

261

Session: Emerging and Non-CMOS Technologies

Fabrication of Full-3D Printed Electronics RF Passive Components and Circuits

A. Salas Barenys¹, N. Vidal¹, J. Sieiro¹, J. Lopez Villegas¹, B. Medina², F. Ramos²

¹University of Barcelona, Spain, ²Francisco Albero S.A.U. (FAE), Spain

265

Modeling and Simulation of Novel GaN-based Light Emitting Transistor for Display Applications

S. Lee, I. Yun

Yonsei University, South Korea

269

Improving Deep Learning with a Customizable GPU-Like FPGA-Based Accelerator

M. Gagliardi, E. Fusella, A. Cilaro

University of Napoli Federico II, Italy

273

Analysis and Verification of Identical-Order Mixed-Matrix Fractional-Order Capacitor Networks

A. Kartci¹, A. Agambayev², N. Herencsar¹, K. Salama²

¹Brno University of Technology, Czech Republic, ²King Abdullah University of Science and Technology, Saudi Arabia

277

Author Index

281