

# **2010 2nd Asia Symposium on Quality Electronic Design**

**(ASQED 2010)**

**Penang, Malaysia  
3-4 August 2010**



**IEEE Catalog Number: CFP1083H-PRT**  
**ISBN: 978-1-4244-7809-5**

# 2010 ASQED – Table of Contents

## SESSION 1A Sensors and Imaging

Chair: Ateet Bhalla Co-Chair: Tanay Karnik, Intel

<b>1A.1: A 0.18<math>\mu</math>m CMOS Shock Wave Generator with an On-chip Antenna and a Digitally Programmable Time Delay Circuit.....</b>	<b>1</b>
Nguyen KHANH, Masahiro SASAKI, Kunihiro ASADA, Taihei MONMA - The University of Tokyo	
<b>1A.2: FPGA Implementation of Compressive Sampling for Sensor Network Applications .....</b>	<b>5</b>
Yan Wang, Amine Bermak - Hong Kong University of Science and Technology; Farid Boussaid - University of Western Australia	
<b>1A.3: Block-Based Compressive Sampling for Digital Pixel Sensor Array .....</b>	<b>9</b>
Milin Zhang, Yan Wang, Amine Bermak - Hong Kong University of Science and Technology	
<b>1A.4: Gate Driver Circuit Design Optimization for TFT-LCD Panel Manufacturing.....</b>	<b>13</b>
Kuo-Fu Lee, Yiming Li, I-Hsiu Lo - National Chiao Tung University; Yiming Li - National Nano Device Laboratories; Tony Chiang, Kuen-Yu Huang, Tsau-Hua Hsieh - Chimei-InnoLux Corporation	

## SESSION 1B Power Gating and Power Distribution Noise

Chair: Suphachai Sutanthavibul Co-Chair: Yu Wang, Tsinghua University

<b>1B.1: High-Speed and Low-Leakage MTCMOS Memory Registers.....</b>	<b>17</b>
Hailong Jiao and Volkan Kursun - The Hong Kong University of Science and Technology	
<b>1B.2: PCH Power Gating Domains Implementation and Design Challenges.....</b>	<b>23</b>
Chee Kong Ung, Sean Chan, Lee Kee Yong, Jess Cheng Sing Kiu - Intel Microelectronics	
<b>1B.3: A Toggle-Type Peak Hold Circuit for Local Power Supply Noise Detection.....</b>	<b>29</b>
Yuki Tamaki, Toru Nakura, Makoto Ikeda, Kunihiro Asada - The University of Tokyo	
<b>1B.4: Dynamic Forward Body Bias Enhanced Tri-Mode MTCMOS.....</b>	<b>33</b>
Hailong Jiao and Volkan Kursun - The Hong Kong University of Science and Technology	
<b>1B.5: Power Density Aware Power Gate Placement Optimization Scheme.....</b>	<b>38</b>
Lee Kee Yong and Chee Kong Ung - Intel Microelectronics	

## SESSION 1C Micro Electro-Mechanical Systems

Chair: Farhang Yazdani

<b>1C.1: Temperature Dependent Actuation Voltage for Longer MEMS Switch Lifetime.....</b>	<b>43</b>
Chean Hung Lai and Wallace S.H Wong - Swinburne University of Technology - Sarawak	
<b>1C.2: Experimental Considerations for Fabrication of RF MEMS Switches .....</b>	<b>49</b>
Hamood Ur Rahman and Rodica Ramer - University of New South Wales (UNSW)	
<b>1C.3: Review of Papers on Architecture and Operation of Micro-thermophotovoltaic System for MEMS Power Generation .....</b>	<b>56</b>
Othman Sidek, Mohammad Zulfikar Ishak, Jalal Abd. Aziz, Muhamad Azman Miskam - Universiti Sains Malaysia	
<b>1C.4: Dry Etching Process Using XeF<sub>2</sub> on Microhotplate Device .....</b>	<b>62</b>
Zarina Tardan and Zaini Abdul Halim - Universiti Sains Malaysia	

## SESSION 1P Poster Papers

Chair: Volkan Kursun, Hong Kong University of Science and Technology

<b>1P.1: Process Variation Study of Ground Plane SOI MOSFET.....</b>	<b>66</b>
Mehdi Saremi, Behzad Ebrahimi, Ali Afzali-Kusha - University of Tehran; Mohammad Saremi - Azad University of Khorram Abad	
<b>1P.2: Thermal Analysis of High Power LEDs at Different Drive-In Current .....</b>	<b>70</b>
Wei-Ching Liew, Chao-Yui Ong, Mutharasu Devarajan - University Science Malaysia	
<b>1P.3: The Influence of Still Air Environment on Thermal Transient Measurement of High Power LED .....</b>	<b>76</b>
Permal Anithambigai, Nadarajah Teeba, Kandasamy Dinash, Devarajan Mutharasu - Universiti Sains Malaysia	

<b>1P.4: Variable Gain CMOS Potentiostat for Dissolved Oxygen Sensor .....</b>	<b>80</b>
Mei Yee Ng and Yuzman Yusoff - MIMOS	
<b>1P.5: Package Level Failure Analysis: New Techniques and New Instruments for Better Results .....</b>	<b>84</b>
Simona Pappalardo, Davide Caccialanza, Zukhairi Md Sarip - STMicroelectronics	
<b>1P.6: A Model for Transient Fault Propagation Considering Glitch Amplitude and Rise-Fall Time Mismatch .....</b>	<b>89</b>
Farshad Firouzi, Saman Kiamehr, Poya Monshizadeh, Ali Afzali-Kusha, Sied Mehdi Fakhraie - University of Tehran; Mohammad Saremi - Azad University of Khorram Abad	
<b>1P.7: Design of a Contactless Sensor System for Woven-Bag Manufacture Monitoring .....</b>	<b>93</b>
Montri Supattatham, Narongrit Waraporn, Weerasak Thumbanthu, Jonathan H. Chan - King Mongkut's University of Technology Thonburi	
<b>1P.8: A Lower-Band UWB LNA with Integrated 7kV/15kV ESD Protection .....</b>	<b>98</b>
He Tang, Xin Wang, Q. Fang, Lin Lin, J. Liu, H. Zhao, Albert Wang - University of California Riverside; Bo Qin – CitrusCom Semiconductor; Siqiang Fan - Freescale Semiconductor; Jun He - GSMC	
<b>1P.9: Mixed AC/DC-Coupled Averaging Technique for ADC Nonlinearity Reduction .....</b>	<b>102</b>
Siqiang Fan, Bin Zhao - Freescale Semiconductor; Hui Zhao, He Tang, Xin Wang, L. Lin, J. Liu, Q. Fang, Albert Wang - University of California Riverside	

## **SESSION 2A Advances in Analog & RF IC Design and Modeling**

Chair: Farhang Yazdani Co-Chair: Volkan Kursun, Hong Kong University of Science and Technology

<b>2A.1: A Nonlinear S-parameters Behavioral Model for RF LNAs .....</b>	<b>106</b>
Tamer Riad and Qi Jing - Mentor Graphics Corp.	
<b>2A.2: Characterizing PLL Jitter from Power Supply Fluctuation Using Mixed-Signal Simulations.....</b>	<b>112</b>
Qi Jing, Tamer Riad, See-Mei Chan - Mentor Graphics Corp.	
<b>2A.3: Design and Measurement of Band V WCDMA LNA Utilizing Design Kit with Scalable Parametric Cell Inductors .....</b>	<b>118</b>
Syahrizal Salleh and Mohamad Faizal Hashim - Telekom R&D	
<b>2A.4: Functional ECO Automation Challenges and Solutions .....</b>	<b>126</b>
Andal Jayalakshmi - Intel Corporation	
<b>2A.5: A Low-Noise Phase-Locked Loop with Programmable Gain VCO.....</b>	<b>130</b>
Lip Kai Soh - Altera Corporation	

## **SESSION 2B Automation Algorithms and VLSI Architectures**

Chair: Kyoungrok Cho Co-Chair: Young Hwan Kim

<b>2B.1: Throughput-Driven Hierarchical Placement for Two-Dimensional Regular Multicycle Communication Architecture.....</b>	<b>134</b>
Ya-Shih Huang and Juinn-Dar Huang - National Chiao Tung University	
<b>2B.2: Adaptive Hardware Context-Switching Approach for Reconfigurable Systems .....</b>	<b>140</b>
Trong-Yen Lee, Shiau-Jiun Tseng, Che-Cheng Hu - National Taipei University of Technology	
<b>2B.3: A Novel VLSI Architecture for Walsh-Hadamard Transform .....</b>	<b>146</b>
Sudip Ghosh, Somsubhra Talapatra, Santi P Maity, Hafizur Rahaman - Bengal Engineering and Science University - Shibpur	
<b>2B.4: Extended Compatibility Path Based Hardware Binding Algorithm for Area-Time Efficient Designs .....</b>	<b>151</b>
Udit Dhawan, Sharad Sinha, Siew-Kei Lam, Thambipillai Srikanthan - Nanyang Technological University	
<b>2B.5: Locality Considerations in Exploring Custom Instruction Selection Algorithms .....</b>	<b>157</b>
Amir Yazdanbakhsh, Mostafa E. Salehi, Saeed Safari, Sied Mehdi Fakhraie - University of Tehran	

## SESSION 2C Advances in Design Verification

Chair: Chin Hai Ang, Altera Corp. Co-Chair: Sudarshan Bahukudumbi, Intel Corp.

<b>2C.1: Enhanced on-Die RC Characterization Methodology</b> .....	163
Fern Nee Tan and Li Chuang Quek - Intel Microelectronics	
<b>2C.2: Performance Modeling Based on Core/Cache Design Validation Results for Predictive Analysis</b> .....	170
Sze Ming Chow and Al Vin Tan - Intel Corporation	
<b>2C.3: Design Aware Scheduling of Dynamic Testbench Controlled Design Element Accesses in FPGA-based HW/SW Co-simulation Systems for Fast Functional Verification</b> .....	175
Somnath Banerjee and Tushar Gupta - Mentor Graphics Pvt. Ltd.	
<b>2C.4: Constraint Sequence Solving for VLSI Design</b> .....	182
Ateet Bhalla - Technocrats Institute of Technology	
<b>2C.5: A Systems Approach to Verification Using Hardware Acceleration</b> .....	189
Sharad Kumar, Sainath Shanbhag, Mohit Mongia, Gaurav Verma - Freescale Semiconductor	

## SESSION 3A Biochips and Biomedical Circuits

Chair: Yu Wang, Tsinghua University Co-Chair: Yiran Chen

<b>3A.1: A new CMOS/Microfluidic Interface for Cells Manipulation and Separation in LoC Devices (INVITED)</b> .....	194
Mohamed Amine Miled and Mohamad Sawan - Ecole Polytechnique de Montreal	
<b>3A.2: Toward Fault-Tolerant and Reconfigurable Digital Microfluidic Biochips (INVITED)</b> .....	198
Krishnendu Chakrabarty and Yang Zhao, Duke University	

## SESSION 4A Bio-sensing and Bio-system Design

Chair: Krishnendu Chakrabarty Co-Chair: Wei Zhang, Nanyang Technological University

<b>4A.1: A 1.2-V Reconfigurable Resolution CMOS Image Sensor with Energy Harvesting Capability (INVITED)</b> .....	208
Chao Shi and Amine Bermak - Hong Kong University of Science and Technology	
<b>4A.2: Membrane Protein Biosensor Arrays on CMOS (INVITED)</b> .....	212
Andrew Mason and Yue Huang - Michigan State University	
<b>4A.3: Hardware Computing for Brain Network Analysis (INVITED)</b> .....	219
Yu Wang, Yi Shan, Tianji Wu, Di Wu, Huazhong Yang - Tsinghua Univ; Yong He - Beijing Normal Univ.	
<b>4A.4: Digital Signal Processing Electronics in Bio-implantable Systems: Design Challenges and Emerging Solutions (INVITED)</b> .....	223
Seetharam Narasimhan, Swarup Bhunia - Case Western Reserve University; Jongsun Park - Korea University	
<b>4A.5: The Application of Spintronic Devices in Magnetic Bio-sensing (INVITED)</b> .....	230
Yiran Chen and Xiaobin Wang - Seagate Technology; Zhenyu Sun and Hai Li - Polytechnic Institute of New York University	

## SESSION 4B Reliability Enhancement Techniques and Modeling of Process Variations

Chair: Young Hwan Kim Co-Chair: Lee Kee Yong

<b>4B.1: Optimizing Device Size for Soft Error Resilience in Sub-Micron Logic Circuits</b> .....	235
Warin Sootkaneung and Kewal K. Saluja - University of Wisconsin-Madison	
<b>4B.2: Statistical Leakage Estimation for DRAM Circuits</b> .....	243
Hyungwoo Lee, Heejung So, Seungho Jung, Chanseok Hwang, Jongbae Lee, Moonhyun Yoo - Samsung Electronics Co., Ltd	
<b>4B.3: Spatial Correlation Extraction with a Limited Amount of Measurement Data</b> .....	248
Shu-Han Whi, Bing-Shiun Su, Yu-Min Lee, Chi-Wen Pan - National Chiao Tung University	

<b>4B.4: Peak Current Reduction Using an MTCMOS Technique</b> .....	<b>255</b>
Liang-Ying Lu and Lih-Yih Chiou - National Cheng Kung University; Tsung-Yi Wu and Jing-Wen Shi - National Changhua University of Education	
<b>4B.5: A New Block-Based SSTA Method Considering Within-die Variation</b> .....	<b>260</b>
Saman Kia Mehr, Amir Reza Ahmadi Mehr, Seyed Nima Mozaffari, Ali Afzali Kusha - University of Tehran	

## **SESSION 4C Emerging Technologies and Noise Isolation Techniques**

Chair: Farhang Yazdani      Co-Chair: Rohit Sharma

<b>4C.1: A Complementary Single-Electron 4-bit Multiplexer</b> .....	<b>264</b>
Thomas Tsiolakis and George Alexiou - University of Patras; Nikos Konofaos - University of the Aegean	
<b>4C.2: Crosstalk Analysis in Carbon Nanotube Interconnects and its Impact on Gate Oxide Reliability</b> .....	<b>272</b>
Debaprasad Das and Hafizur Rahaman - Bengal Engineering and Science University	
<b>4C.3: Active Filters for Harmonics Elimination in Solar Photovoltaic Grid-Connected and Stand-Alone Systems</b> .....	<b>280</b>
Indranil Bhattacharya, Yuhang Deng, Simon Foo - Florida State University	
<b>4C.4: The Impact of Electromagnetic Coupling of Guard Ring Metal Lines on the Performance of On-chip Spiral Inductor in Silicon CMOS</b> .....	<b>285</b>
Mohd Hafis Mohd Ali, Chun-Lee Ler, Subhash C. Rustagi, Yusman M. Yusof, Narain D. Arora - Silterra Malaysia; Mohd Hafis Mohd Ali, Burhanuddin Y. Majlis - Universiti Kebangsaan Malaysia	
<b>4C.5: An Analog Optimal Waveform Design for UWB Communications</b> .....	<b>289</b>
Ahmad Ghanaatian-Jahromi, Adib Abrishamifar, Abbas Akbarzadeh - Iran University of Science and Technology; Ali Medi - Sharif University of Technology	

## **SESSION 5A Design for Low Power and Reliability**

Chair: Suphachai Sutanthavibul      Co-Chair: Lee Kee Yong

<b>5A.1: A High Throughput, Metastability-Free GALS Channel Based on Pausible Clock Method</b> .....	<b>294</b>
Mohammad Ali Rahimian, Siamak Mohammadi, Mohammad Fattah - University of Tehran	
<b>5A.2: A Case Study of Short Term Cell-Flipping Technique for Mitigating NBTI Degradation on Cache</b> .....	<b>301</b>
Yuji Kunitake, Hiroto Yasuura - Kyushu University, Toshinori Sato - Fukuoka University Toshinori Sato, Hiroto Yasuura - Japan Science and Technology Agency	
<b>5A.3: An Analysis of Fault Effects and Propagations in ZPU: The World's Smallest 32 bit CPU</b> .....	<b>308</b>
Mahroo Zandrahimi, Hamid R. Zarandi, Alireza Rohani - Amirkabir University	
<b>5A.4: Effect of Gate-level Design Margin Relaxation on Overall Circuit Performance Metrics in VLSI Design</b> .....	<b>314</b>
Jae Hoon Kim and Young Hwan Kim - Pohang University of Science and Technology	
<b>5A.5: A High Throughput Low Power Compact AES S-box Implementation using Composite Field Arithmetic and Algebraic Normal Form Representation</b> .....	<b>318</b>
M. M. Wong and M. L. D. Wong - Swinburne University of Technology - Sarawak	

## **SESSION 5B IC Packaging and Power Delivery**

Chair: Farhang Yazdani      Co-Chair: Ibrahim Bin Ahmad

<b>5B.1: A Formal Approach toward Developing an Equivalent Circuit for High-Speed Coupled Interconnects with Intermediate Ground Insertion</b> .....	<b>324</b>
Rohit Sharma and Kiyoung Choi - Seoul National University	
<b>5B.2: Wirebond Vs. Flip Chip Design of High Speed 3D Stacked Memory Packages</b> .....	<b>332</b>
Farhang Yazdani - BroadPak Corporation	
<b>5B.3: A Study on the Electrical Properties of the Power Distribution Network Using a Hybrid Domain Decomposition Method</b> .....	<b>337</b>
Varvara Kollia and Manuel Luschas - NetLogic Microsystems; Andreas Cangellaris - University of Illinois at Urbana-Champaign	

<b>5B.4: Fast Transient Simulation Algorithm for a 3D Power Distribution Bus.....</b>	<b>343</b>
Waqar Ahmad, Qiang Chen, Li-Rong Zheng, Hannu Tenhunen - KTH Royal Institute of Technology Sweden; Rajeev Kumar Kanth - University of Turku	
<b>5B.5: Efficient Reduction Technique of Resistive Mesh Structured Power Network .....</b>	<b>351</b>
Jinwook Kim and Young Hwan Kim - Pohang University of Science and Technology	

## **SESSION 5C Semiconductor Technologies and Scaling Issues**

Chair: Ateet Bhalla      Co-Chair: Rajiv Joshi, IBM

<b>5C.1: Statistical Model for Subthreshold Current Considering Process Variations .....</b>	<b>356</b>
Seyed Nima Mozaffari and Ali Afzali-Kusha - University of Tehran	
<b>5C.2: Derivative Superposition Method for DG MOSFET Application to RF Mixer .....</b>	<b>361</b>
Shuai Huang, Xinnan Lin, Yiqun Wei, Jin He - Peking University	
<b>5C.3: Nonlinear Mismatch Modeling of Resistor Device for Circuit Simulations.....</b>	<b>366</b>
Muhamad Amri Ismail and Iskhandar Md Nasir - MIMOS Berhad	
<b>5C.4: Phase Change Memory and Paradigm Shift to In-System Programming .....</b>	<b>371</b>
Darwin Wong, Clifford Smith, Poorna Kale - Micron Technology	
<b>5C.5: Effect of High Tensile Inter Layer Dielectric on Hook Shaped <math>I_{dsat}</math> Characteristics of 0.13um CMOS Technology .....</b>	<b>375</b>
Philip Beow Yew Tan, Chin Fui Chua, Subhash Chander Rustagi - Silterra Malaysia Sdn. Bhd.	