

2015 Symposium on VLSI Circuits

(VLSI Circuits 2015)

Kyoto, Japan
17-19 June 2015



IEEE Catalog Number: CFP15VLS-POD
ISBN: 978-1-4799-8337-7

TABLE OF CONTENTS

Technology SESSION 1 - Welcome and Plenary Session [Shunju I, II, III]

Tuesday, June 16, 8:20-10:05

Chairpersons: S. Inaba, Toshiba Electronics Korea Corp.
M. Khare, IBM Research

1-1 - 8:20

Welcome and Opening Remarks

T. Hiramoto, The Univ. of Tokyo
R. Jammy, Intermolecular

1-2 - 8:45

Robotics for Innovation, H. Hirukawa, AIST, Japan 1

1-3 - 9:25

System Challenges and Hardware Requirements for Future Consumer Devices: From Wearable to ChromeBooks and Devices in-between, E. Shiu and S. Prakash, Google, USA 5

Technology SESSION 2 - Highlight [Shunju I, II, III]

Tuesday, June 16, 10:30-12:10

Chairpersons: K. Miyashita, Toshiba Corp.
G. Yeap, Qualcomm Inc.

2-1 - 10:30

A 14 nm SoC Platform Technology Featuring 2nd Generation Tri-Gate Transistors, 70 nm Gate Pitch, 52 nm Metal Pitch, and 0.0499 μm^2 SRAM Cells, Optimized for Low Power, High Performance and High Density SoC Products, C.-H. Jan, F. Al-amoodi, H.-Y. Chang, T. Chang, Y.-W. Chen, N. Dias, W. Hafez, D. Ingerly, M. Jang, E. Karl, S. K.-Y. Shi, K. Komeyli, H. Kilambi, A. Kumar, K. Byon, C.-G. Lee, J. Lee, T. Leo, P.-C. Liu, N. Nidhi, R. Olac-vaw, C. Petersburg, K. Phoa, C. Prasad, C. Quincy, R. Ramaswamy, T. Rana, L. Rockford, A. Subramaniam, C. Tsai, P. Vandervoorn, L. Yang, A. Zainuddin and P. Bai, Intel Corp., USA 10

2-2 - 10:55

Highly Reliable TaO_x ReRAM with Centralized Filament for 28-nm Embedded Application, Y. Hayakawa*, A. Himeno*, R. Yasuhara*, W. Boullart**, E. Vecchio**, T. Vandeweyer**, T. Witters**, D. Crotti**, M. Jurczak**, S. Fujii*, S. Ito*, Y. Kawashima*, Y. Ikeda*, A. Kawahara*, K. Kawai*, Z. Wei*, S. Muraoka*, K. Shimakawa*, T. Mikawa* and S. Yoneda*, *Panasonic Corp., Japan and **imec, Belgium 12

2-3 - 11:20

High-Mobility High-Ge-Content Si_{1-x}Ge_xOI PMOS FinFETs with Fins Formed Using 3D Germanium Condensation with Ge Fraction Up to x~ 0.7, Scaled EOT~8.5Å and ~10nm Fin Width, P. Hashemi, T. Ando, K. Balakrishnan, J. Bruley, S. Engelmann, J. A. Ott, V. Narayanan, D.-G. Park, R. T. Mo and E. Leobandung, IBM T. J. Watson Research Center, USA 14

2-4 - 11:45

Design and Demonstration of Reliability-Aware Ge Gate Stacks with 0.5 nm EOT, C. Lu***, C. H. Lee***, T. Nishimura*** and A. Toriumi***, *The Univ. of Tokyo and **JST-CREST, Japan 16

Technology / Circuits Joint Evening Panel Discussion Semiconductor Industry in 2020: Evolution or Revolution? 18

Tuesday, June 16, 20:00-22:00

Organizers: Technology
N. Sugii, Hitachi, Ltd.
G. Jurczak, imec
Circuits
M. Yamaoka, Hitachi, Ltd.
A. Molnar, Cornell Univ.

Moderators: J. Tham, Broadcom Corp.
T. Piliszczuk, Soitec

Panelists: O. Nalamasu, Applied Materials
J. Hausner, Intel Mobile Communications GmbH
S. Tanaka, Murata
T. Yamauchi, Renesas Electronics Corp.
S. Sivaram, SanDisk
C. Diaz, TSMC
W. Dai, VeriSilicon

SESSION 1 - Welcome and Plenary Session [Shunju I, II, III]

Wednesday, June 17, 8:30-10:05

Chairpersons: M. Motomura, Hokkaido Univ.
G. Lehmann, Infineon Technologies AG

1-1 - 8:30

Welcome and Opening Remarks

H. Kabuo, Socionext Inc.
J. Gealow, Analog Devices, Inc.

1-2 - 8:45

Profiting from IoT: The Key is Very-Large-Scale Happiness Integration, K. Yano, T. Akitomi, K. Ara, J. Watanabe, S. Tsuji, N. Sato, M. Hayakawa and N. Moriwaki, Hitachi, Ltd., Japan 19

1-3 - 9:25

Automated Driving – Impacts on the Vehicle Architecture, M. Fausten, T. Huck, A. Rühle, T. Baysal and R. Kornhaas, Robert Bosch GmbH, Germany 23

Technology / Circuits Joint Focus Session 1

Ultra Low Power for IoT [Shunju II, III]

Wednesday, June 17, 10:30-12:35

Chairpersons: M. Tada, NEC Corp.
G. Yeric, ARM Ltd.

JFS1-1 - 10:30

Automotive Low Power Technology for IoT Society, T. Yamauchi, H. Kondo and K. Nii, Renesas Electronics Corp., Japan 27

JFS1-2 - 10:55

IoT: the Impact of Things, J. de Boeck***, *imec and **KU Leuven, Belgium 29

JFS1-3 - 11:20

Transistor-Interconnect Mobile System-On-Chip Co-Design Method for Holistic Battery Energy Minimization, N. N. Mojumder, S. C. Song, K. Rim, J. Xu, J. Wang, J. Zhu, M. Vratonjic, K. Lin, M. Saint-Laurent, P. Bassett and G. Yeap, Qualcomm Technologies, Inc., USA 31

JFS1-4 - 11:45

Sub- μW Standby Power, <18 $\mu\text{W}/\text{DMIPS}@25\text{MHz}$ MCU with Embedded Atom-Switch Programmable Logic and ROM, Y. Tsuji, X. Bai, M. Miyamura, T. Sakamoto, M. Tada, N. Banno, K. Okamoto, N. Iguchi, N. Sugii and H. Hada, LEAP, Japan 33

JFS1-5 - 12:10 Breakthrough Technologies and Reference Designs for New IoT Applications , P. Magarshack, STMicroelectronics, France	(Invited) 35	Technology / Circuits Joint Focus Session 2 Emerging NVM [Shunju II, III] Wednesday, June 17, 13:55-16:00 Chairpersons: S. S. Chung, National Chiao Tung Univ. B.-K. Liew, nVidia	
SESSION 2 - Image Processing [Suzaku II] Wednesday, June 17, 10:30-12:35 Chairpersons: H. Noda, Renesas Electronics Corp. S. Sridhara, Apple		JFS2-1 - 13:55 The Progresses of MRAM as a Memory to Save Energy Consumption and Its Potential for Further Reduction , H. Yoda, E. Kitagawa, N. Shimomura, S. Fujita and M. Amano, Toshiba Corp., Japan	(Invited) 57
2-1 - 10:30 A 0.5-Degree Error 10mW CMOS Image Sensor-Based Gaze Estimation Processor with Logarithmic Processing , K. Bong, I. Hong, G. Kim and H.-J. Yoo, KAIST, Korea	37	JFS2-2 - 14:20 Challenges for High-Density 16Gb ReRAM with 27nm Technology , S. Sills*, S. Yasuda**, A. Calderoni*, C. Cardon*, J. Strand*, K. Aratani** and N. Ramaswamy*, *Micron Technology, Inc., USA and **Sony Corp., Japan	(Invited) 59
2-2 - 10:55 A 23mW Face Recognition Accelerator in 40nm CMOS with Mostly-Read 5T Memory , D. Jeon***, Q. Dong*, Y. Kim*, X. Wang***, S. Chen***, H. Yu***, D. Blaauw* and D. Sylvester*, *Univ. of Michigan, **Massachusetts Institute of Technology, USA and ***Nanyang Technological Univ., Singapore	39	JFS2-3 - 14:45 Low-Power Embedded ReRAM Technology for IoT Applications , M. Ueki, K. Takeuchi, T. Yamamoto, A. Tanabe, N. Ikarashi, M. Saitoh, T. Nagumo, H. Sunamura, M. Narihiro, K. Uejima, K. Masuzaki, N. Furutake, S. Saito, Y. Yabe, A. Mitsui, K. Takeda, T. Hase and Y. Hayashi, Renesas Electronics Corp., Japan	61
2-3 - 11:20 A 640M pixel/s 3.65mW Sparse Event-Driven Neuromorphic Object Recognition Processor with On-Chip Learning , J. K. Kim, P. Knag, T. Chen and Z. Zhang, Univ. of Michigan, USA	41	JFS2-4 - 15:10 RRAM-Based 7T1R Nonvolatile SRAM with 2x Reduction in Store Energy and 94x Reduction in Restore Energy for Frequent-Off Instant-On Applications , A. Lee*, M.-F. Chang*, C.-C. Lin*, C.-F. Chen***, M.-S. Ho***, C.-C. Kuo****, P.-L. Tseng****, S.-S. Sheu**** and T. K. Ku****, *National Tsing Hua Univ., **NDL, ***National Chung Hsin Univ. and ****ITRI, Taiwan	63
2-4 - 11:45 A 33 nJ/Vector Descriptor Generation Processor for Low-Power Object Recognition , D. Shin, I. Hong, G. Kim and H.-J. Yoo, KAIST, Korea	43	JFS2-5 - 15:35 Reliability Enhancement of 1Xnm TLC for Cold Flash and Millennium Memories , S. Yamazaki, S. Tanakamaru, S. Suzuki, T. O. Iwasaki, S. Hachiya and K. Takeuchi, Chuo Univ., Japan	65
2-5 - 12:10 Single-Chip 4K 60fps 4:2:2 HEVC Video Encoder LSI with 8K Scalability , T. Onishi*, T. Sano*, Y. Nishida*, K. Yokohari*, J. Su*, K. Nakamura*, K. Nitta*, K. Kawashima**, J. Okamoto**, N. Ono*, R. Kusaba*, A. Sagata*, H. Iwasaki*, M. Ikeda* and A. Shimizu*, *NTT Media Intelligence Laboratories and **NTT Network Technology Laboratories, Japan	45	SESSION 4 - Image Sensors [Suzaku II] Wednesday, June 17, 13:55-16:00 Chairpersons: H. Wakabayashi, Sony Corp. D. Sylvester, Univ. of Michigan	
SESSION 3 - SARADCs & SC Filter [Suzaku III] Wednesday, June 17, 10:30-12:35 Chairpersons: N. Miura, Kobe Univ. R. Kapusta, Analog Devices, Inc.		4-1 - 13:55 Image Sensor/Digital Logic 3D Stacked Module Featuring Inductive Coupling Channels for High Speed/Low-Noise Image Transfer , M. Ikebe*, D. Uchida*, Y. Take**, M. Someya*, S. Chikuda*, K. Matsuyama*, T. Asai*, T. Kuroda** and M. Motomura*, *Hokkaido Univ. and **Keio Univ., Japan	67
3-1 - 10:30 A Sharp Programmable Passive Filter Based on Filtering by Aliasing , N. Sinha*, M. Rachid** and S. Pamarti*, *Univ. of California, Los Angeles and **Silvus Technologies Inc, USA	47	4-2 - 14:20 A 0.66e⁻⁷ rms Temporal-Readout-Noise 3D-Stacked CMOS Image Sensor with Conditional Correlated Multiple Sampling (CCMS) Technique , S.-F. Yeh, K.-Y. Chou, H.-Y. Tu, C. Y.-P. Chao and F.-L. Hsueh, TSMC, Taiwan	69
3-2 - 10:55 A 120nW 8b Sub-Ranging SAR ADC with Signal-Dependent Charge Recycling for Biomedical Applications , S. Jeong*, W. Jung*, D. Jeon**, O. Berenfeld*, H. Oral*, G. Kruger*, D. Blaauw* and D. Sylvester*, *Univ. of Michigan and **Massachusetts Institute of Technology, USA	49	4-3 - 14:45 A 0.4V Self-Powered CMOS Imager with 140dB Dynamic Range and Energy Harvesting , A. Y.-C. Chiou and C.-C. Hsieh, National Tsing Hua Univ., Taiwan	71
3-3 - 11:20 A 12b 70MS/s SAR ADC with Digital Startup Calibration in 14nm CMOS , C. C. Lee, C.-Y. Lu, R. Narayanaswamy and J. B. Rizk, Intel Corp., USA	51	4-4 - 15:10 A Linear Response Single Exposure CMOS Image Sensor with 0.5e⁻⁷ Readout Noise and 76ke⁻² Full Well Capacity , S. Wakashima, F. Kusuhara, R. Kuroda and S. Sugawa, Tohoku Univ., Japan	73
3-4 - 11:45 A 9.35-ENOB, 14.8 fJ/Conv.-Step Fully-Passive Noise-Shaping SAR ADC , Z. Chen, M. Miyahara and A. Matsuzawa, Tokyo Institute of Technology, Japan	53		
3-5 - 12:10 A 12-Bit 200-MS/s 3.4-mW CMOS ADC with 0.85-V Supply , J. P. Mathew, L. Kong and B. Razavi, Univ. of California, Los Angeles, USA	55		

4-5 - 15:35	A 3D Stacked CMOS Image Sensor with 16Mpixel Global-Shutter Mode and 2Mpixel 10000fps Mode Using 4 Million Interconnections , T. Kondo, Y. Takemoto, K. Kobayashi, M. Tsukimura, N. Takazawa, H. Kato, S. Suzuki, J. Aoki, H. Saito, Y. Gomi, S. Matsuda and Y. Tadaki, Olympus, Japan	75
SESSION 5 - Low Power Wireless Transceivers [Suzaku III] Wednesday, June 17, 13:55-16:00 Chairpersons: K. Agawa, Toshiba Corp. G. Gammie, MediaTek Inc.		
5-1 - 13:55	A 3.5mW 315/400MHz IEEE802.15.6/Proprietary Mode Digitally-Tunable Radio SoC with Integrated Digital Baseband and MAC Processor in 40nm CMOS , C. Bachmann*, M. Vidojkovic*, X. Huang*, M. Lont*, Y.-H. Liu*, M. Ding*, B. Busze*, J. Gloudemans*, H. Giesen*, A. Sbai*, G.-J. van Schaik*, N. Kiyani*, K. Kanda**, K. Oishi**, S. Masui**, K. Philips* and H. de Groot*, *imec, The Netherlands and **Fujitsu Laboratories, Japan	77
5-2 - 14:20	A 1Gb/s Energy Efficient Triple-Channel UWB-Based Cognitive Radio , N.-S. Kim and J. M. Rabaey, Univ. of California, Berkeley, USA	79
5-3 - 14:45	A 0.6V All-Digital Body-Coupled Wakeup Transceiver for IoT Applications , P. N. Whatnough*, G. Smart**, S. Das*, Y. Andreopoulos** and D. M. Bull*, *ARM Ltd. and **Univ. College London, UK	81
5-4 - 15:10	A Self-Powered IPv6 Bidirectional Wireless Sensor & Actuator Network for Indoor Conditions , P. Urard*, G. Romagnello*, A. Banciu*, J. C. Grasset*, V. Heinrich*, M. Boulemlakher*, F. Todeschni*, L. Damon*, R. Guizzetti*, L. Andre** and A. Cathelin*, *STMicroelectronics and **CEA-LETI, France	83
5-5 - 15:35	A 794Mbps 135mW Iterative Detection and Decoding Receiver for 4x4 LDPC-Coded MIMO Systems in 40nm , W.-H. Wu*, W.-C. Sun*, C.-H. Yang** and Y.-L. Ueng*, *National Tsing Hua Univ. and **National Chiao Tung Univ., Taiwan	85
SESSION 6 - Bio Monitoring Circuits [Suzaku II] Wednesday, June 17, 16:15-17:55 Chairpersons: C.-Y. Lee, National Chiao Tung Univ. J. DeBrosse, IBM		
6-1 - 16:15	A 16-Channel Wireless Neural Interfacing SoC with RF-Powered Energy-Replenishing Adiabatic Stimulation , S. Ha, A. Akinin, J. Park, C. Kim, H. Wang, C. Maier, G. Cauwenberghs and P. P. Mercier, Univ. of California, San Diego, USA	87
6-2 - 16:40	Enabling Closed-Loop Neural Interface: A Bi-Directional Interface Circuit with Stimulation Artifact Cancellation and Cross-Channel CM Noise Suppression , A. E. Mendrela, J. Cho, J. A. Fredenburg, C. A. Chestek, M. P. Flynn and E. Yoon, Univ. of Michigan, USA	89
6-3 - 17:05	Neurochemical Thermostat: A Neural Interface SoC with Integrated Chemometrics for Closed-Loop Regulation of Brain Dopamine , B. Bozorgzadeh*, D. Schuweiler**, M. Bobak**, P. A. Garris** and P. Mohseni*, *Case Western Reserve Univ. and **Illinois State Univ., USA	91
6-4 - 17:30	Toward 1024-Channel Parallel Neural Recording: Modular Δ-Δ Analog Front-End Architecture with 4.84fJ/C-s²mm² Energy-Area Product , S.-Y. Park, J. Cho, K. Na and E. Yoon, Univ. of Michigan, USA	93
SESSION 7 - Optical Links [Suzaku III] Wednesday, June 17, 16:15-17:55 Chairpersons: K. Sunaga, NEC Corp. G. Van der Plas, imec		
7-1 - 16:15	A 19.6-Gbps CMOS Optical Receiver with Local Feedback IIR DFE , A. Sharif-Bakhtiar and A. C. Carusone, Univ. of Toronto, Canada	95
7-2 - 16:40	56Gb/s PAM4 and NRZ SerDes Transceivers in 40nm CMOS , J. Lee, P.-C. Chiang and C.-C. Weng, National Taiwan Univ., Taiwan	97
7-3 - 17:05	A 25-Gb/s, -10.8-dBm Input Sensitivity, PD-Bandwidth Tolerant CMOS Optical Receiver , S.-H. Huang and W.-Z. Chen, National Chiao Tung Univ., Taiwan	99
7-4 - 17:30	A 45nm SOI Monolithic Photonics Chip-to-Chip Link with Bit-Statistics-Based Resonant Microring Thermal Tuning , C. Sun***, M. Wade***, M. Georgas**, S. Lin*, L. Alloati**, B. Moss**, R. Kumar***, A. Atabaki**, F. Pavanello***, R. Ram**, M. Popović*** and V. Stojanović*, *Univ. of California, Berkeley, **Massachusetts Institute of Technology and ***Univ. of Colorado, USA	101
SESSION 8 - Circuits Focus Session - Systems for Big Data Management [Suzaku II] Thursday, June 18, 8:30-10:10 Chairpersons: M. Yamaoka, Hitachi, Ltd. C. Dray, Intel Mobile Communications GmbH		
8-1 - 8:30	FPGA-Accelerated Complex Event Processing , T. Takenaka, H. Inoue, T. Hosomi and Y. Nakamura, NEC Corp., Japan	103
8-2 - 8:55	Inductively-Powered Wireless Solid-State Drive (SSD) System with Merged Error Correction of High-Speed Non-Contact Data Links and NAND Flash Memory , A. Kosuge*, J. Hashiba*, T. Kawajiri*, S. Hasegawa*, T. Shidei*, H. Ishikuro*, T. Kuroda* and K. Takeuchi**, *Keio Univ. and **Chuo Univ., Japan	105
8-3 - 9:20	Privacy-Protection Solid-State Storage (PP-SSS) System: Automatic Lifetime Management of Internet-Data's Right to be Forgotten , S. Tanakamaru, H. Yamazawa and K. Takeuchi, Chuo Univ., Japan	107
8-4 - 9:45	Caching Mechanisms towards Single-Level Storage Systems for Internet of Things , Y. Bando, K. Watanabe, K. Maeda, H. Kudo, M. Ishiyama, A. Kunimatsu, H. Nakai, M. Takahashi and Y. Oowaki, Toshiba Corp., Japan	109
SESSION 9 - Phase and Delay Locked Loops [Suzaku III] Thursday, June 18, 8:30-10:10 Chairpersons: S. H. Cho, KAIST A. Momtaz, Broadcom Corp.		

9-1 - 8:30 An All-Digital Bang-Bang PLL Using Two-Point Modulation and Background Gain Calibration for Spread Spectrum Clock Generation , S. Jang, S. Kim, S.-H. Chu, G.-S. Jeong, Y. Kim and D.-K. Jeong, Seoul National Univ., Korea	111
9-2 - 8:55 A Digital Bang-Bang Phase-Locked Loop with Automatic Loop Gain Control and Loop Latency Reduction , T.-K. Kuan and S.-I. Liu, National Taiwan Univ., Taiwan	113
9-3 - 9:20 A 0.4-1.6GHz Spur-Free Bang-Bang Digital PLL in 65nm with a D-Flip-Flop Based Frequency Subtractor Circuit , B. Kim***, S. Kundu* and C. H. Kim*, *Univ. of Minnesota and **Rambus Inc., USA	115
9-4 - 9:45 A 450-fs Jitter PVT-Robust Fractional-Resolution Injection-Locked Clock Multiplier Using a DLL-Based Calibrator with Replica-Delay-Cells , M. Kim, S. Choi and J. Choi, Ulsan National Institute of Science and Technology (UNIST), Korea	117
SESSION 10 - Circuits Focus Session - IoT and Smart Systems [Suzaku II] Thursday, June 18, 10:30-12:35 Chairpersons: S. Nimmagadda, Intel Technology India Pvt Ltd. A. Cathelin, STMicroelectronics	
10-1 - 10:30 (Invited) Embedded Image Recognition Systems for Advanced Safety Vehicles , M. Takemura, T. Shima and S. Muramatsu, Hitachi, Ltd., Japan	119
10-2 - 10:55 High-Level Video Analytics PC Subsystem Using SoC with Heterogeneous Multi-Core Architecture , Y. Sasagawa and A. Mori, Panasonic Corp., Japan	121
10-3 - 11:20 A Throughput-Agnostic 11.9-13.6GOPS/mW Multi-Signal Classification SoC for Cognitive Radios in 40nm CMOS , F.-L. Yuan*, R. K. Palani**, S. Basir-Kazeruni*, H. Shih**, A. Saha**, R. Harjani** and D. Marković*, *Univ. of California, Los Angeles and **Univ. of Minnesota, USA	123
10-4 - 11:45 A Multi-Chip System Optimized for Insect-Scale Flapping-Wing Robots , X. Zhang, M. Lok, T. Tong, S. Chaput, S. K. Lee, B. Reagen, H. Lee, D. Brooks and G.-Y. Wei, Harvard Univ., USA	125
10-5 - 12:10 (Invited) Sensor-Hub Sweet-Spot Analysis for Ultra-Low-Power Always-on Operation , A. Fuks, NXP Semiconductors, USA	127
SESSION 11 - Nyquist ADC and DAC [Suzaku III] Thursday, June 18, 10:30-12:35 Chairpersons: M. Ito, Renesas Electronics Corp. E. Fogleman, MaxLinear	
11-1 - 10:30 A 25GS/s 6b TI Binary Search ADC with Soft-Decision Selection in 65nm CMOS , S. Cai, E. Z. Tabasy, A. Shafik, S. Kiran, S. Hoyos and S. Palermo, Texas A&M Univ., USA	129
11-2 - 10:55 A 3-10fJ/Conv-Step 0.0032mm² Error-Shaping Alias-Free Asynchronous ADC , S. Patil*, A. Ratiu****, D. Morche** and Y. Tsvividis*, *Columbia Univ., USA, **CEA-LETI and ***Univ. de Lyon, France	131
11-3 - 11:20 A 6b 46GS/s ADC with >23GHz BW and Sparkle-Code Error Correction , Y. Duan and E. Alon, Univ. of California, Berkeley, USA	133
11-4 - 11:45 A 14b 750MS/s DAC in 20nm CMOS with <-168dBm/Hz Noise Floor beyond Nyquist and 79dBc SFDR Utilizing a Low Glitch-Noise Hybrid R-2R Architecture , S. M. Lee, D. Seo, S. M. Taleie, D. Kong, M. J. McGowan, T. Song, G. Saripalli, J. Kuo and S. Bazarjani, Qualcomm Technologies, Inc., USA	135
11-5 - 12:10 A 16-bit 10Gbps Current Steering RF DAC in 65nm CMOS Achieving 65dBc ACLR Multi-Carrier Performance at 4.5GHz Fout , G. Engel, M. Clara, H. Zhu and P. Wilkins, Analog Devices, Inc., USA	137
Luncheon Talk [Suzaku I] Thursday, June 18, 12:45-14:05 Organizers: S. Inaba, Toshiba Electronics Korea Corp. M. Motomura, Hokkaido Univ.	
DASSAI: Innovating Sake Brewing with Massive Usage of Data and IT , K. Sakurai, Asahi Shuzo Co., Ltd.	
Technology / Circuits Joint Focus Session 3 Advanced Technology and Circuits for IoT [Suzaku II] Thursday, June 18, 14:20-16:00 Chairpersons: H. Noda, Micron Memory Japan, Inc. E. Yeo, Marvell Semiconductor	
JFS3-1 - 14:20 (Invited) Technology Innovation in an IoT Era , A. Steegen, imec, Belgium	139
JFS3-2 - 14:45 Fabrication of a 3000-6-Input-LUTs Embedded and Block-Level Power-Gated Nonvolatile FPGA Chip Using p-MTJ-Based Logic-in-Memory Structure , D. Suzuki, M. Natsui, A. Mochizuki, S. Miura, H. Honjo, H. Sato, S. Fukami, S. Ikeda, T. Endoh, H. Ohno and T. Hanyu, Tohoku Univ., Japan	141
JFS3-3 - 15:10 Low-Voltage Metal-Fuse Technology Featuring a 1.6V-Programmable 1T1R Bit Cell with an Integrated 1V Charge Pump in 22nm Tri-gate Process , S. H. Kulkarni, Z. Chen, B. Srinivasan, B. Pedersen, U. Bhattacharya and K. Zhang, Intel Corp., USA	143
JFS3-4 - 15:35 Holistic Technology Optimization and Key Enablers for 7nm Mobile SoC , S. C. Song, J. Xu, N. N. Mojumder, K. Rim, D. Yang, J. Bao, J. Zhu, J. Wang, M. Badaroglu, V. Machkaoutsan, P. Narayanasetti, B. Bucki, J. Fischer and G. Yeap, Qualcomm Technologies, Inc., USA	145
SESSION 12 - DRAM [Suzaku III] Thursday, June 18, 14:20-16:00 Chairpersons: K. Sohn, Samsung Electronics Co., Ltd. J. T. Pawlowski, Micron Technology, Inc.	
12-1 - 14:20 A 4x9 Gb/s 1 pJ/b NRZ/Multi-Tone Serial-Data Transceiver with Crosstalk Reduction Architecture for Multi-Drop Memory Interfaces in 40nm CMOS , K. Gharibdoust*, A. Tajalli*** and Y. Leblebici*, *EPFL and **Kandou Bus, Switzerland	147

12-2 - 14:45

A 6.4Gb/s/pin at Sub-1V Supply Voltage TX-Interleaving Technique for Mobile DRAM Interface, C.-K. Lee, M. Ahn, D. Moon, K. Kim, Y.-J. Eom, W.-Y. Lee, J. Kim, S. Yoon, B. Choi, S. Kwon, J.-Y. Park, S.-J. Bae, Y.-C. Bae, J.-H. Choi, S.-J. Jang and G. Jin, Samsung Electronics Co., Ltd., Korea

12-3 - 15:10

A 4.35Gb/s/pin LPDDR4 I/O Interface with Multi-VOH Level, Equalization Scheme, and Duty-Training Circuit for Mobile Applications, H.-K. Jung, J. Yang, J. Lee, H. Ko, H. Lee, T. Song, J. Shim, S.-K. Lee, K. Song, D.-K. Kim, H. Kim and Y. Kim, SK hynix, Korea

12-4 - 15:35

A Computer Designed Half Gb 16-Channel 819Gb/s High-Bandwidth and 10ns Low-Latency DRAM for 3D Stacked Memory Devices Using TSVs, P.-W. Luo*, C.-K. Chen*, Y.-H. Sung**, W. Wu***, H.-C. Shih*, C.-H. Lee*, K.-H. Lee**, M.-W. Li**, M.-C. Lung**, C.-N. Lu**, Y.-F. Chou*, P.-L. Shih**, C.-H. Ke**, C. Shiah**, P. Stolt***, S. Tomishima***, D.-M. Kwai*, B.-D. Rong**, N. Lu**, S.-L. Lu*** and C.-W. Wu*, *ITRI, **Etron Technology, Taiwan and ***Intel Corp., USA

Technology / Circuits Joint Focus Session 4 3D and Heterogeneous Integration [Suzaku II]

Thursday, June 18, 16:15-17:55

Chairpersons: B. Sheu, TSMC
J. L. Nilles, Texas Instruments

JFS4-1 - 16:15

Active-Lite Interposer for 2.5 & 3D Integration, G. Hellings, M. Scholz, M. Detalle, D. Velenis, M. de Potter de ten Broeck, C. Roda Neve, Y. Li, S. Van Huylenbroek, S.-H. Chen, E.-J. Marinissen, A. La Manna, G. Van der Plas, D. Linten, E. Beyne and A. Thean, imec, Belgium

JFS4-2 - 16:40

An 82%-Efficient Multiphase Voltage-Regulator 3D Interposer with On-Chip Magnetic Inductors, K. Tien*, N. Sturcken**, N. Wang***, J.-W. Nah***, B. Dang***, E. O'Sullivan***, P. Andry***, M. Petracca****, L. P. Carloni*, W. Gallagher*** and K. Shepard*, *Columbia Univ., **Ferric Inc., ***IBM T. J. Watson Research Center and ****Cadence Design Systems, USA

JFS4-3 - 17:05

15 dB Conversion Gain, 20 MHz Carrier Frequency AM Receiver in Flexible a-IGZO TFT Technology with Textile Antennas, K. Ishida*, R. Shabanpour*, T. Meister*, B. K. Boroujeni*, C. Carta*, L. Petti**, N. Münzenrieder**, G. A. Salvatore**, G. Tröster** and F. Ellinger*, *Technische Universität Dresden, Germany and **Swiss Federal Institute of Technology Zurich, Switzerland

JFS4-4 - 17:30

Reconstruction of Multiple-User Voice Commands Using a Hybrid System Based on Thin-Film Electronics and CMOS, L. Huang, J. Sanz-Robinson, T. Moy, Y. Hu, W. Rieutort-Louis, S. Wagner, J. C. Sturm and N. Verma, Princeton Univ., USA

SESSION 13 - Sensors & Bio Imaging [Suzaku I]

Thursday, June 18, 16:15-17:55

Chairpersons: M. Ikeda, The Univ. of Tokyo
N. Verma, Princeton Univ.

13-1 - 16:15

A Self-Referenced VCO-Based Temperature Sensor with 0.034°C/mV Supply Sensitivity in 65nm CMOS, T. Anand*, K. A. A. Makinwa** and P. K. Hanumolu*, *Univ. of Illinois, USA and **Delft Univ. of Technology, The Netherlands

13-2 - 16:40

A 10.6mm³ Fully-Integrated, Wireless Sensor Node with 8GHz UWB Transmitter, H. Kim, G. Kim, Y. Lee, Z. Foo, D. Sylvester, D. Blaauw and D. Wentzloff, Univ. of Michigan, USA 165

13-3 - 17:05

A 4.84mW 30fps Dual Frequency Division Multiplexing Electrical Impedance Tomography SoC for Lung Ventilation Monitoring System, Y. Lee, K. Song and H.-J. Yoo, KAIST, Korea 167

13-4 - 17:30

A Fully Integrated CMOS Fluorescence Biosensor with On-Chip Nanophotonic Filter, L. Hong, S. McManus, H. Yang and K. Sengupta, Princeton Univ., USA 169

SESSION 14 - Application-Specific IOs [Suzaku III]

Thursday, June 18, 16:15-17:55

Chairpersons: J.-Y. Sim, POSTECH
R. Navid, Rambus Inc.

14-1 - 16:15

An Efficient and Resilient Ultra-High Speed Galvanic Data Isolator Leveraging Broad-Band Multi Resonant Tank Electro-Magnetic Coupling, S. Sankaran*, B. Kramer*, G. Howard, B. Sutton*, R. Walberg*, V. Khanolkar*, R. Payne* and M. Morgan*, *Texas Instruments Inc., USA 171

14-2 - 16:40

A 100-GbE Reverse Gearbox IC in 40nm CMOS for Supporting Legacy 10- and 40-GbE Standards, T. Yoon*, J.-Y. Lee*, K. Han**, J. Lee**, S. Lee**, T. Kim**, H. Won*, J. Park** and H.-M. Bae*, *KAIST and **TeraSquare Inc., Korea 173

14-3 - 17:05

A 2.7mW/Channel 48-to-1000MHz Direct Sampling Full-Band Cable Receiver, J. Wu*, G. Cusmai*, A. (W.-T.) Chou*, T. Wang*, B. Shen*, V. Periasamy*, M.-H. Hsieh**, C.-Y. Chen*, L. He*, L. Tan*, A. Padyana*, C.-H. Yang**, G. Unruh*, J. (K. L.) Wong*, J.-J. Hung*, M. Brandolini*, S.-T. Lin**, X. Chen*, Y. Ding**, Y.-J. Ko**, Y. Shin*, A. Hung*, B. Chen*, C. Dang*, D. Lakshminarasimhan*, I. (H.) Liu*, J. Lin*, K. Lai*, L. Wassermann*, A. Shrivastava*, C.-M. Hsiao**, C.-S. Huang**, J. Chen*, L. Krishnan*, N.-Y. Wang*, P.-E. Su*, T. Li*, W.-T. Shih**, Y.-C. Yang**, P. Cangiane*, R. Perlow*, W. Ngai*, H.-S. Huang**, J. Y. C. Chang*, X. Jiang*, A. Venes* and R. Gomez*, *Broadcom Corp., USA and **Broadcom Corp., Taiwan 175

14-4 - 17:30

A Fully Integrated IEEE 802.15.7 Visible Light Communication Transmitter with On-Chip 8-W 85% Efficiency Boost LED Driver, B. Hussain, F. Che, F. Zhang, T. S. Yim, L. Cheng, W.-H. Ki, C. P. Yue and L. Wu, The Hong Kong Univ. of Science and Technology, China 177

Circuits Evening Panel Discussion 1

Is University Circuit Design Research and Education Keeping Up with Industry Needs? [Suzaku I] 179

Thursday, June 18, 20:00-22:00

Organizers: P. Yue, Hong Kong Univ. of Science and Technology
R. Navid, Rambus Inc.

Moderator: P. Yue, Hong Kong Univ. of Science and Technology

Panelists: B. Sheu, TSMC
A. Matsuzawa, Tokyo Institute of Technology
K. Asada, The Univ. of Tokyo
L. Loh, MediaTek Inc.
K. Makinwa, Delft Univ. of Technology
S. Borkar, Intel Corp.
V. Stojanovic, Univ. of California, Berkeley

Circuits Evening Panel Discussion 2

Wearable Electronics: Still an Oasis or Just a Mirage for the Semiconductor Industry? [Suzaku II, III]

Thursday, June 18, 20:00-22:00

Organizers: Y.-S. Shu, MediaTek Inc.
N. Verma, Princeton Univ.

Moderator: N. Verma, Princeton Univ.

Panelists: K. Yano, Hitachi, Ltd.
T. Someya, The Univ. of Tokyo
H.-J. Yoo, KAIST
K. Vasanth, Texas Instruments Inc.
D. Blaauw, Univ. of Michigan
L. Krishnamurthy, Intel Corp.
S. J. Kim, Samsung Electronics Co., Ltd.

SESSION 15 - Ultra-High Speed Receivers [Suzaku I]

Friday, June 19, 8:30-10:10

Chairpersons: Y. Tomita, Fujitsu Laboratories Ltd.
P. Hanumolu, Univ. of Illinois

15-1 - 8:30

A 32 Gb/s 0.55 mW/Gbps PAM4 1-FIR 2-IIR Tap DFE Receiver in 65-nm CMOS, O. Elhadidy, A. Roshan-Zamir, H.-W. Yang and S. Palermo, Texas A&M Univ., USA

181

15-2 - 8:55

A 40-Gb/s 9.2-mW CMOS Equalizer, A. Manian and B. Razavi, Univ. of California, Los Angeles, USA

183

15-3 - 9:20

A 5.9mW/Gb/s 7Gb/s/pin 8-Lane Single-Ended RX with Crosstalk Cancellation Scheme Using a XCTLE and 56-Tap XDPE in 32nm SOI CMOS, A. Cevrero*, C. Aprile**, P. A. Francese*, U. Bapst*, C. Menolfi*, M. Braendli*, M. Kossel*, T. Morf*, L. Kull*, H. Yueksel*, I. Oezkaya*, Y. Leblebici**, V. Cevher** and T. Toifl*, *IBM Research and **EPFL, Switzerland

185

15-4 - 9:45

A 60Gb/s 173mW Receiver Frontend in 65nm CMOS Technology, J. Han*, Y. Lu**, N. Sutardja*, K. Jung* and E. Alon*, *Univ. of California, Berkeley and **Qualcomm Atheros Inc., USA

187

SESSION 16 - Oscillators [Suzaku II]

Friday, June 19, 8:30-10:10

Chairpersons: J. Lee, National Taiwan Univ.
A. Molnar, Cornell Univ.

16-1 - 8:30

A Dithering-Less 54.79-to-63.16GHz DCO with 4-Hz Frequency Resolution Using an Exponentially-Scaling C-2C Switched-Capacitor Ladder, Z. Huang and H. C. Luong, Hong Kong Univ. of Science and Technology, China

189

16-2 - 8:55

A -194 dBc/Hz FOM Interactive Current-Reused QVCO (ICR-QVCO) with Capacitor-Coupling Self-Switching Sinusoidal Current Biasing (CSCB) Phase Noise Reduction Technique, K.-I. Wu*, I.-S. Shen**, C. F. Jou** and C. C.-P. Chen*, *National Taiwan Univ. and **National Chiao Tung Univ., Taiwan

191

16-3 - 9:20

A 99nW 70.4kHz Resistive Frequency Locking On-Chip Oscillator with 27.4ppm/°C Temperature Stability, M. Choi, S. Bang, T.-K. Jang, D. Blaauw and D. Sylvester, Univ. of Michigan, USA

193

16-4 - 9:45

4.2 pW Timer for Heavily Duty-Cycled Systems, P. M. Nadeau, A. Paidimarri and A. P. Chandrakasan, Massachusetts Institute of Technology, USA

195

SESSION 17 - Low-Power and Secure Design [Suzaku III]

Friday, June 19, 8:30-10:10

Chairpersons: K. Fujii, NTT Microsystem Integration Labs.
J. Tschanz, Intel Corp.

17-1 - 8:30

A Low-PDP and Low-Area Repeater Using Passive CTLE for On-Chip Interconnects, M.-S. Chen, M.-C. F. Chang and C.-K. K. Yang, Univ. of California, Los Angeles, USA

197

17-2 - 8:55

1.32GHz High-Throughput Charge-Recovery AES Core with Resistance to DPA Attacks, S. Lu, Z. Zhang and M. Papaefthymiou, Univ. of Michigan, USA

199

17-3 - 9:20

A Robust -40 to 120°C All-Digital True Random Number Generator in 40nm CMOS, K. Yang, D. Blaauw and D. Sylvester, Univ. of Michigan, USA

201

17-4 - 9:45

A 3.07 μm^2 /Bitcell Physically Unclonable Function with 3.5% and 1% Bit-Instability across 0 to 80°C and 0.6 to 1.2V in a 65nm CMOS, J. Li and M. Seok, Columbia Univ., USA

203

SESSION 18 - Wideband Over-Sampled ADCs [Suzaku I]

Friday, June 19, 10:30-12:35

Chairpersons: S. Doshu, Tokyo Institute of Technology
B. P. Ginsburg, Texas Instruments

18-1 - 10:30

A 75 MHz BW 68dB DR CT- $\Sigma\Delta$ Modulator with Single Amplifier Biquad Filter and a Broadband Low-Power Common-Gate Summing Technique, C. Briseno-Vidrios, A. Edward, A. Shafik, S. Palermo and J. Silva-Martinez, Texas A&M Univ., USA

205

18-2 - 10:55

A 54mW 1.2GS/s 71.5dB SNDR 50MHz BW VCO-Based CT $\Delta\Sigma$ ADC Using Dual Phase/Frequency Feedback in 65nm CMOS, K. Reddy*, S. Dey*, S. Rao*, B. Young*, P. Prabha* and P. K. Hanumolu**, *Oregon State Univ. and **Univ. of Illinois, USA

207

18-3 - 11:20

A 7.2 mW 75.3 dB SNDR 10 MHz BW CT Delta-Sigma Modulator Using Gm-C-Based Noise-Shaped Quantizer and Digital Integrator, T. Kim, C. Han and N. Maghari, Univ. of Florida, USA

209

18-4 - 11:45

A 16nm FinFet 19/39MHz 78/72dB DR Noise-Injected Aggregated CTSDM ADC for Configurable LTE Advanced CCA/NCCA Application, T.-K. Kao, P. Chen, J.-Y. Tsai and P.-C. Chiu, MediaTek Inc., Taiwan

211

18-5 - 12:10

A 10/20/30/40 MHz Feed-Forward FIR DAC Continuous-Time $\Delta\Sigma$ ADC with Robust Blocker Performance for Radio Receivers, S. Loeda, J. Harrison, F. Pourchet and A. Adams, Broadcom Corp., Australia

213

SESSION 19 - SRAM and CAM [Suzaku II]

Friday, June 19, 10:30-12:35

Chairpersons: H. Yamauchi, Fukuoka Institute of
Technology
V. Chandra, ARM Ltd.**19-1 - 10:30****A 0.094 μm^2 High Density and Aging Resilient 8T SRAM with 14nm FinFET Technology Featuring 560mV V_{MIN} with Read and Write Assist**, K.-H. Koo, L. Wei, J. Keane, U. Bhattacharya, E. A. Karl and K. Zhang, Intel Corp., USA **215****19-2 - 10:55****14nm FinFET Based Supply Voltage Boosting Techniques for Extreme Low V_{min} Operation**, R.V. Joshi*, M. Ziegler*, H. Wetter**, C. Wandel** and H. Ainspan*, *IBM Research, USA and **IBM, STG, Germany **217****19-3 - 11:20****A Reconfigurable Sense Amplifier with 3X Offset Reduction in 28nm FDSOI CMOS**, M. Khayatizadeh****, F. Frustaci**, D. Blaauw*, D. Sylvester* and M. Alioto***, *Univ. of Michigan, USA, **Univ. of Calabria, Italy, ***National Univ. of Singapore, Singapore and ****Oracle, USA **219****19-4 - 11:45****A Configurable TCAM / BCAM / SRAM Using 28nm Push-Rule 6T Bit Cell**, S. Jeloka*, N. Akesh**, D. Sylvester* and D. Blaauw*, *Univ. of Michigan and **Oracle, USA **221****19-5 - 12:10****1.8 Mbit/mm² Ternary-CAM Macro with 484 ps Search Access Time in 16 nm Fin-FET Bulk CMOS Technology**, Y. Tsukamoto, M. Morimoto, M. Yabuuchi, M. Tanaka and K. Nii, Renesas Electronics Corp., Japan **223****SESSION 20 - Power Management Circuits [Suzaku III]**

Friday, June 19, 10:30-12:35

Chairpersons: C. Yoo, Hanyang Univ.
H. J. Bergveld, NXP Semiconductors**20-1 - 10:30****A 0.78mW/cm² Autonomous Thermoelectric Energy-Harvester for Biomedical Sensors**, D. Rozgić and D. Marković, Univ. of California, Los Angeles, USA **225****20-2 - 10:55****Solar Energy Harvesting System with Integrated Battery Management and Startup Using Single Inductor and 3.2nW Quiescent Power**, D. El-Damak and A. P. Chandrakasan, Massachusetts Institute of Technology, USA **227****20-3 - 11:20****A 2.5-V, 160- μJ -Output Piezoelectric Energy Harvester and Power Management IC for Batteryless Wireless Switch (BWS) Applications**, J. Yang, M. Lee, M.-J. Park, S.-Y. Jung and J. Kim, Seoul National Univ., Korea **229****20-4 - 11:45****A 144MHz Integrated Resonant Regulating Rectifier with Hybrid Pulse Modulation**, C. Kim, S. Ha, J. Park, A. Akinin, P. P. Mercier and G. Cauwenberghs, Univ. of California, San Diego, USA **231****20-5 - 12:10****A 5.5W AC Input Converter-Free LED Driver with 82% Low-Frequency-Flicker Reduction, 88.2% Efficiency and 0.92 Power Factor**, Y. Gao, L. Li and P. K. T. Mok, The Hong Kong Univ. of Science and Technology, China **233****SESSION 21 - Delta-Sigma Modulators and Analog Techniques [Suzaku I]**

Friday, June 19, 13:55-16:00

Chairpersons: Y.-S. Shu, MediaTek Inc.
Y. Chiu, Univ. of Texas at Dallas**21-1 - 13:55****A 0.7 V 256 μW $\Delta\Sigma$ Modulator with Passive RC Integrators Achieving 76 dB DR in 2 MHz BW**, J. L. A. de Melo, J. Goes and N. Paulino, Universidade Nova de Lisboa, Portugal **235****21-2 - 14:20****A 13-ENOB, 5 MHz BW, 3.16 mW Multi-Bit Continuous-Time $\Delta\Sigma$ ADC in 28 nm CMOS with Excess-Loop-Delay Compensation Embedded in SAR Quantizer**, G. Wei, P. Shettigar, F. Su, X. Yu and T. Kwan, Broadcom Corp., USA **237****21-3 - 14:45****A Low-Power Gm-C-Based CT- $\Delta\Sigma$ Audio-Band ADC in 1.1V 65nm CMOS**, I. Ahmed, J. Cherry, A. Hasan, A. Nafee, D. Halupka, Y. Allasameh and M. Snelgrove, Kapik Integration Toronto, Canada **239****21-4 - 15:10****7.4 μW Ultra-High Slew-Rate Pseudo Single-Stage Amplifier Driving 0.1-to-15nF Capacitive Load with >69° Phase Margin**, S.-W. Hong*** and G.-H. Cho**, *Samsung Electronics Co., Ltd. and **KAIST, Korea **241****21-5 - 15:35****A Fully Integrated $\pm 5\text{A}$ Current-Sensing System with $\pm 0.25\%$ Gain Error and 12 μA Offset from -40°C to +85°C**, S. H. Shalmany*, G. Beer**, D. Draxelmayr*** and K. Makinwa*, *Delft Univ. of Technology, The Netherlands, **Infineon Technologies, Germany and ***Infineon Technologies, Austria **243****SESSION 22 - High Speed and High Frequency TX/RX [Suzaku II]**

Friday, June 19, 13:55-16:00

Chairpersons: H. Ishikuro, Keio Univ.
J. Paramesh, Carnegie Mellon Univ.**22-1 - 13:55****410-GHz CMOS Imager Using a 4th Sub-Harmonic Mixer with Effective NEP of 0.3 fW/Hz^{0.5} at 1-kHz Noise Bandwidth**, W. Choi*, Z. Ahmad*, A. Jha*, J.-Y. Lee**, I. Kim*** and Kenneth K. O*, *Univ. of Texas at Dallas, USA, **Electronics and Telecommunications Research Institute, Korea and ***Samsung Telecommunications America, USA **245****22-2 - 14:20****A CMOS 4-Channel MIMO Baseband Receiver with 65dB Harmonic Rejection over 48MHz and 50dB Spatial Signal Separation over 3MHz at 1.3mW**, C. Kim*, S. Joshi*, C. Thomas*, S. Ha*, A. Akinin*, L. Larson** and G. Cauwenberghs*, *Univ. of California, San Diego, and **Brown Univ., USA **247****22-3 - 14:45****A 60GHz Wireless Transceiver Employing Hybrid Analog/Digital Beamforming with Interference Suppression for Multiuser Gigabit/s Radio Access**, K. Takinami, N. Shirakata, K. Tanaka, T. Tsukizawa, H. Motozuka, Y. Morishita, K. Miyanaga, T. Sakamoto, T. Urushihara, M. Kobayashi, H. Takahashi, M. Irie, H. Yoshikawa, A. Yoshimoto, M. Irie, M. Nakamura, T. Watanabe, H. Komori and N. Saito, Panasonic Corp., Japan **249****22-4 - 15:10****A TDD/FDD SAW-Less Superheterodyne Receiver with Blocker-Resilient Band-Pass Filter and Multi-Stage HR in 28nm CMOS**, I. Madadi*, M. Tohidian*, K. Cornelissens**, P. Vandenameele** and R. B. Staszewski****, *Delft Univ. of Technology, The Netherlands, **M4S/Hisilicon, Belgium and ***University College Dublin, Ireland **251****22-5 - 15:35****0.65-0.73THz Quintupler with an On-Chip Antenna in 65-nm CMOS**, Z. Ahmad and Kenneth K. O., The Univ. of Texas at Dallas, USA **253**

SESSION 23 - Advanced Technologies for Processors [Suzaku III]

Friday, June 19, 13:55-16:00

Chairpersons: M. Hariyama, Tohoku Univ.
S. Dillen, Qualcomm Inc.

23-1 - 13:55

Broadwell : A Family of IA 14nm Processors, A. Nalamalpu, N. Kurd, A. Deval, C. Mozak, J. Douglas, A. Khanna, F. Paillet, G. Schrom and B. Phelps, Intel Corp., USA

255

23-2 - 14:20

A RISC-V Vector Processor with Tightly-Integrated Switched-Capacitor DC-DC Converters in 28nm FDSOI, B. Zimmer*, Y. Lee*, A. Puggelli*, J. Kwak*, R. Jevtic*, B. Keller*, S. Bailey*, M. Blagojevic**, P.-F. Chiu*, H.-P. Le*, P.-H. Chen*, N. Sutardja*, R. Avizienis*, A. Waterman*, B. Richards*, P. Flatresse**, E. Alon*, K. Asanović* and B. Nikolić*, *Univ. of California, Berkeley, USA and **STMicroelectronics, France

257

23-3 - 14:45

A 16-Core Voltage-Stacked System with an Integrated Switched-Capacitor DC-DC Converter, S. K. Lee, T. Tong, X. Zhang, D. Brooks and G.-Y. Wei, Harvard Univ., USA

259

23-4 - 15:10

Fully Integrated DC-DC Converter and a 0.4V 32-bit CPU with Timing-Error Prevention Supplied from a Prototype 1.55V Li-Ion Battery, M. Turnquist*, M. Hienkari**, J. Mäkipää***, R. Jevtic****, E. Pohjalainen*, T. Kallio* and L. Koskinen**, *Aalto Univ., **Univ. of Turku, ***VTT National Research Center of Finland, Finland and ****Univ. Carlos III of Madrid, Spain

261

23-5 - 15:35

Resonant Clock Mega-Mesh for the IBM z13™, D. Shan*, P. Restle**, D. Malone*, R. Groves*, E. Lai*, M. Koch***, J. Hibbeler*, Y. Kim*, C. Vezyrtzis**, J. Feder**, D. Hogenmiller* and T. Bucelot**, *IBM Systems, **IBM T. J. Watson Research Center, USA and ***IBM Systems, Germany

263

SESSION 24 - Displays and Sensors [Suzaku I]

Friday, June 19, 16:15-17:55

Chairpersons: Y. Kato, Panasonic Corp.
N. Van Helleputte, imec

24-1 - 16:15

Hybrid Driver IC for Real-Time TFT Non-Uniformity Compensation of Ultra High-Definition AMOLED Display, J.-S. Bang*, H.-S. Kim**, S.-H. Park*, K.-D. Kim*, S.-W. Choi*, O.-J. Kwon**, C.-S. Shin**, J. Lee** and G.-H. Cho*, *KAIST and **Samsung Display, Korea

265

24-2 - 16:40

An AMOLED Microdisplay Driver SoC with Built-In 1.25-Mb/s VLC Transmitter, L. Wu, X. Li, W. C. Chong, Z. Liu, F. Che, B. Hussain, K. M. Lau and C. P. Yue, The Hong Kong Univ. of Science and Technology, China

267

24-3 - 17:05

Wide Input Range 1.7µW 1.2kS/s Resistive Sensor Interface Circuit with 1 Cycle/Sample Logarithmic Sub-Ranging, M. Choi, J. Gu, D. Blaauw and D. Sylvester, Univ. of Michigan, USA

269

24-4 - 17:30

A Near-Field Modulation Chopping Stabilized Injection-Locked Oscillator Sensor for Protein Conformation Detection at Microwave Frequency, J.-C. Chien*, E.-C. Yeh*, L. P. Lee*, M. Anwar** and A. M. Niknejad*, *Univ. of California, Berkeley and **Univ. of California, San Francisco, USA

271

SESSION 25 - DC-DC Converters [Suzaku II]

Friday, June 19, 16:15-17:55

Chairpersons: M. Takamiya, The Univ. of Tokyo
T. Burd, AMD

25-1 - 16:15

A Fully-Integrated 40-Phase Flying-Capacitance-Dithered Switched-Capacitor Voltage Regulator with 6mV Output Ripple, S. Bang*, J.-S. Seo**, I. Lee*, S. Jeong*, N. Pinckney*, D. Blaauw*, D. Sylvester* and L. Chang***, *Univ. of Michigan, **Arizona State Univ. and ***IBM T. J. Watson Research Center, USA

273

25-2 - 16:40

A 1W 8-ratio Switched-Capacitor Boost Power Converter in 140nm CMOS with 94.5% Efficiency, 0.5mm Thickness and 8.1mm² PCB Area, G. V. Piqué, H. J. Bergveld and R. Karadi, NXP Semiconductors, The Netherlands

275

25-3 - 17:05

A Battery-Connected 24-Ratio Switched Capacitor PMIC Achieving 95.5%-Efficiency, L. G. Salem and P. P. Mercier, Univ. of California, San Diego, USA

277

25-4 - 17:30

86.55% Peak Efficiency Envelope Modulator for 1.5W 10MHz LTE PA without AC Coupling Capacitor, S. Sung*, S.-W. Hong**, J.-S. Bang*, J.-S. Paek**, S.-C. Lee**, T. B.-H. Cho** and G.-H. Cho*, *KAIST and **Samsung Electronics Co., Ltd., Korea

279

SESSION 26 - Low-Power Wireline Transceivers [Suzaku III]

Friday, June 19, 16:15-17:55

Chairpersons: C. P. Yue, Hong Kong Univ. of Science and Technology
E. Alon, Univ. of California, Berkeley

26-1 - 16:15

A 0.5-to-0.75V, 3-to-8 Gbps/lane, 385-to-790 fJ/b, Bi-Directional, Quad-Lane Forwarded-Clock Transceiver in 22nm CMOS, R. Inti*, S. Shekhar**, G. Balamurugan*, J. Jaussi*, C. Roberts*, T.-C. Hsueh* and B. Casper*, *Intel Corp., USA and **Univ. of British Columbia, Canada

281

26-2 - 16:40

A 3.8 mW/Gbps Quad-Channel 8.5-13 Gbps Serial Link with a 5-Tap DFE and a 4-Tap Transmit FFE in 28 nm CMOS, T. Ali, L. Rao, U. Singh, M. Abdul-Latif, Y. Liu, A. A. Hafez, H. Park, A. Vasani, Z. Huang, A. Iyer, B. Zhang, A. Momtaz and N. Kocaman, Broadcom Corp., USA

283

26-3 - 17:05

A 1.2-5Gb/s 1.4-2pJ/b Serial Link in 22nm CMOS with a Direct Data-Sequencing Blind Oversampling CDR, S. Shekhar*, R. Inti**, J. Jaussi**, T.-C. Hsueh** and B. Casper**, *Univ. of British Columbia, Canada and **Intel Corp., USA

285

26-4 - 17:30

A 2.8mW/Gb/s 14Gb/s Serial Link Transceiver in 65nm CMOS, S. Saxena, G. Shu, R. K. Nandwana, M. Talegaonkar, A. Elkholly, T. Anand, S. J. Kim, W.-S. Choi and P. K. Hanumolu, Univ. of Illinois, USA

287