

2017 IEEE International Electron Devices Meeting (IEDM 2017)

San Francisco, California, USA
2-6 December 2017



IEEE Catalog Number: CFP17IED-POD
ISBN: 978-1-5386-3560-5

**Copyright © 2017 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:	CFP17IED-POD
ISBN (Print-On-Demand):	978-1-5386-3560-5
ISBN (Online):	978-1-5386-3559-9
ISSN:	0163-1918

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

1.1 - MULTI-CHIP TECHNOLOGIES TO UNLEASH COMPUTING PERFORMANCE GAINS OVER THE NEXT DECADE.....	1
<i>Lisa T. Su ; Samuel Naffziger ; Mark Papermaster</i>	
1.2 - ENERGY EFFICIENT COMPUTING AND SENSING IN THE ZETTABYTE ERA: FROM SILICON TO THE CLOUD	9
<i>Adrian M. Ionescu</i>	
1.3 - SYSTEM SCALING FOR INTELLIGENT UBIQUITOUS COMPUTING	17
<i>Jack Y. -C. Sun</i>	
2.1 - BREAKTHROUGH OF SELECTOR TECHNOLOGY FOR CROSS-POINT 25-NM RERAM	24
<i>Soo Gil Kim ; Jong Chul Lee ; Tae Jung Ha ; Jong Ho Lee ; Jae Yeon Lee ; Yong Taek Park ; Kyung Wan Kim ; Won Ki Ju ; Young Seok Ko ; Hyun Mi Hwang ; Bo Mi Lee ; Joo Young Moon ; Woo Young Park ; Byung Gu Gyun ; Byoung-Ki Lee ; Donggyu Yim ; Sung-Joo Hong</i>	
2.2 - AN ULTRA HIGH ENDURANCE AND THERMALLY STABLE SELECTOR BASED ON TEASGESISE CHALCOGENIDES COMPATIBLE WITH BEOL IC INTEGRATION FOR CROSS-POINT PCM	28
<i>H. Y. Cheng ; W. C. Chien ; I. T. Kuo ; E. K. Lai ; Y. Zhu ; J. L. Jordan-Sweet ; A. Ray ; F. Carta ; F. M. Lee ; P. H. Tseng ; M. H. Lee ; Y. Y. Lin ; W. Kim ; R. Bruce ; C. W. Yeh ; C. H. Yang ; M. Brightsky ; H. L. Lung</i>	
2.3 - IN-DEPTH INVESTIGATION OF PROGRAMMING AND READING OPERATIONS IN RRAM CELLS INTEGRATED WITH OVONIC THRESHOLD SWITCHING (OTS) SELECTORS	32
<i>M. Alayan ; E. Vianello ; G. Navarro ; C. Carabasse ; S. La Barbera ; A. Verdy ; N. Castellani ; A. Levisse ; G. Molas ; L. Grenouillet ; T. Magis ; F. Aussenaac ; M. Bernard ; B. Desalvo ; J. M. Portal ; E. Nowak</i>	
2.4 - BEOL BASED RRAM WITH ONE EXTRA-MASK FOR LOW COST, HIGHLY RELIABLE EMBEDDED APPLICATION IN 28 NM NODE AND BEYOND.....	36
<i>Hangbing Lv ; Xiaoxin Xu ; Peng Yuan ; Danian Dong ; Tiancheng Gong ; Jing Liu ; Zhaoan Yu ; Peng Huang ; Kun Zhang ; Changxing Huo ; Chanbing Chen ; Yuanlu Xie ; Qing Luo ; Shibing Long ; Qi Liu ; Jinfeng Kang ; Daisy Yang ; Simon Yin ; Shengsen Chiu ; Ming Liu</i>	
2.5 - A COMPREHENSIVE STUDY OF 3-STAGE HIGH RESISTANCE STATE RETENTION BEHAVIOR FOR TMO RERAMS FROM SINGLE CELLS TO A LARGE ARRAY	40
<i>Yu-Hsuan Lin ; Yung-Han Ho ; Ming-Hsiu Lee ; Chao-Hung Wang ; Yu-Yu Lin ; Feng-Ming Lee ; Kai-Chieh Hsu ; Po-Hao Tseng ; Dai-Ying Lee ; Kuang-Hao Chiang ; Keh-Chung Wang ; Tseung-Yuen Tseng ; Chih-Yuan Lu</i>	
2.6 - INTEGRATED HFO₂-RRAM TO ACHIEVE HIGHLY RELIABLE, GREENER, FASTER, COST-EFFECTIVE, AND SCALED DEVICES	44
<i>Chiahua Ho ; Shuo-Che Chang ; Chao-Yi Huang ; Yu-Cheng Chuang ; Seow-Fong Lim ; Ming-Huei Hsieh ; Shu- Cheng Chang ; Hsiu-Han Liao</i>	
2.7 - 8-LAYERS 3D VERTICAL RRAM WITH EXCELLENT SCALABILITY TOWARDS STORAGE CLASS MEMORY APPLICATIONS	48
<i>Qing Luo ; Xiaoxin Xu ; Tiancheng Gong ; Hangbing Lv ; Danian Dong ; Haili Ma ; Peng Yuan ; Jianfeng Gao ; Jing Liu ; Zhaoan Yu ; Junfeng Li ; Shibing Long ; Qi Liu ; Ming Liu</i>	
3.1 - 3D SEQUENTIAL INTEGRATION: APPLICATION-DRIVEN TECHNOLOGICAL ACHIEVEMENTS AND GUIDELINES	52
<i>P. Batude ; L. Brunet ; C. Fenouillet-Beranger ; F. Andrieu ; J. -P. Colinge ; D. Lattard ; E. Vianello ; S. Thuries ; O. Billoint ; P. Vivet ; C. Santos ; B. Mathieu ; B. Sklenard ; C. -M. V. Lu ; J. Micout ; F. Deprat ; E. Avelar Mercado ; F. Ponthenier ; N. Rambal ; M. -P. Samson ; M. Cassé ; S. Hentz ; J. Arcamone ; G. Sicard ; L. Hutin ; L. Pasini ; A. Ayres ; O. Rozeau ; R. Berthelon ; F. Nemouchi ; P. Rodriguez ; J. -B. Pin ; D. Larmagnac ; A. Duboust ; V. Ripoche ; S. Barraud ; N. Allouti ; S. Barnola ; C. Vizioz ; J. -M. Hartmann ; S. Kerdiles ; P. Acosta Alba ; S. Beaurepaire ; V. Beugin ; F. Fournel ; P. Besson ; V. Loup ; R. Gassilloud ; F. Martin ; X. Garros ; F. Mazen ; B. Previtali ; C. Euvrard-Colnat ; V. Balan ; C. Comboroure ; M. Zussy ; Mazzocchi ; O. Faynot ; M. Vinet</i>	
3.2 - PIXEL/DRAM/LOGIC 3-LAYER STACKED CMOS IMAGE SENSOR TECHNOLOGY.....	56
<i>H. Tsugawa ; H. Takahashi ; R. Nakamura ; T. Umebayashi ; T. Ogita ; H. Okano ; K. Iwase ; H. Kawashima ; T. Yamasaki ; D. Yoneyama ; J. Hashizume ; T. Nakajima ; K. Murata ; Y. Kanaishi ; K. Ikeda ; K. Tatani ; T. Nagano ; H. Nakayama ; T. Haruta ; T. Nomoto</i>	
3.3 - POWER INSIDE — APPLICATIONS AND TECHNOLOGIES FOR INTEGRATED POWER IN MICROELECTRONICS.....	60
<i>C. Ó Mathúna ; S. Kulkarni ; Z. Pavlovic ; D. Casey ; J. Rohan ; A. -M. Kelleher ; G. Maxwell ; J. O'Brien ; P. McCloskey</i>	
3.4 - 3D SYSTEM PACKAGE ARCHITECTURE AS ALTERNATIVE TO 3D STACKING OF ICS WITH TSV AT SYSTEM LEVEL.....	64
<i>Rao R. Tummala</i>	

3.5 - ADVANCED PACKAGING SAVES THE DAY! — HOW TSV TECHNOLOGY WILL ENABLE CONTINUED SCALING.....	67
<i>L. England ; I. Arsovski</i>	
3.6 - ADVANCED PACKAGING WITH GREATER SIMPLICITY	71
<i>Douglas C. H. Yu</i>	
3.7 - TOWARDS CUBE-SIZED COMPUTE NODES: ADVANCED PACKAGING CONCEPTS ENABLING EXTREME 3D INTEGRATION.....	75
<i>T. Brunschwiler ; G. Schlottig ; A. Sridhar ; P. Bezerra ; P. Ruch ; N. Ebejer ; H. Oppermann ; J. Kleff ; W. Steller ; M. Jatlaoui ; F. Voiron ; Z. Pavlovic ; P. McCloskey ; D. Bremner ; P. Parida ; F. Krismer ; J. Kolar ; B. Michel</i>	
4.1 - ATOMISTIC INVESTIGATION OF THE ELECTRONIC STRUCTURE, THERMAL PROPERTIES AND CONDUCTION DEFECTS IN GE-RICH Ge_xSe_{1-x} MATERIALS FOR SELECTOR APPLICATIONS.....	79
<i>S. Clima ; B. Govoreanu ; K. Opsomer ; A. Velea ; N. S. Avasarala ; W. Devulder ; I. Shlyakhov ; G. L. Donadio ; T. Witters ; S. Kundu ; L. Goux ; V. Afanasiev ; G. S. Kar ; G. Pourtois</i>	
4.2 - AB-INITIO MODELING OF CBRAM CELLS: FROM BALLISTIC TRANSPORT PROPERTIES TO ELECTRO-THERMAL EFFECTS	83
<i>F. Ducry ; A. Embors ; S. Andermatt ; M. H. Bani-Hashemian ; B. Cheng ; J. Leuthold ; M. Luisier</i>	
4.3 - FUNDAMENTAL MECHANISM BEHIND VOLATILE AND NON-VOLATILE SWITCHING IN METALLIC CONDUCTING BRIDGE RAM.....	87
<i>Nikhil Shukla ; Ram Krishna Ghosh ; Benjamin Grisafe ; Suman Datta</i>	
4.4 - MODELING DISORDER EFFECT OF THE OXYGEN VACANCY DISTRIBUTION IN FILAMENTARY ANALOG RRAM FOR NEUROMORPHIC COMPUTING	91
<i>Bin Gao ; Huaqiang Wu ; Wei Wu ; Xiaohu Wang ; Peng Yao ; Yue Xi ; Wenqiang Zhang ; Ning Deng ; Peng Huang ; Xiaoyan Liu ; Jinfeng Kang ; Hong-Yu Chen ; Shimeng Yu ; He Qian</i>	
4.5 - COMPREHENSIVE INVESTIGATIONS ON CHARGE DIFFUSION PHYSICS IN SIN- BASED 3D NAND FLASH MEMORY THROUGH SYSTEMATICAL AB INITIO CALCULATIONS	95
<i>Jixuan Wu ; Dan Han ; Wenjing Yang ; Shiyou Chen ; Xiangwei Jiang ; Jiezhi Chen</i>	
4.6 - A PHYSICS-BASED QUASI-2D MODEL TO UNDERSTAND THE WORDLINE (WL) INTERFERENCE EFFECTS OF JUNCTION-FREE STRUCTURE OF 3D NAND AND EXPERIMENTAL STUDY IN A 3D NAND FLASH TEST CHIP	99
<i>Wei-Chen Chen ; Hang-Ting Lue ; Chih-Chang Hsieh ; Yung-Chun Lee ; Pei-Ying Du ; Tzu-Hsuan Hsu ; Kuo-Pin Chang ; Keh-Chung Wang ; Chih-Yuan Lu</i>	
4.7 - TEMPERATURE ACTIVATION OF THE STRING CURRENT AND ITS VARIABILITY IN 3-D NAND FLASH ARRAYS.....	103
<i>D. Resnati ; A. Mannara ; G. Nicosia ; G. M. Paolucci ; P. Tessariol ; A. L. Lacaita ; A. S. Spinelli ; C. Monzio Compagnoni</i>	
5.1 - GATE-TUNABLE MEMRISTORS FROM MONOLAYER MOS2	107
<i>Vinod K. Sangwan ; Hong-Sub Lee ; Mark C. Hersam</i>	
5.2 - FIRST DEMONSTRATION OF HIGH PERFORMANCE 2D MONOLAYER TRANSISTORS ON PAPER SUBSTRATES	111
<i>Saungeun Park ; Deji Akinwande</i>	
5.3 - ROOM TEMPERATURE 2D MEMRISTIVE TRANSISTOR WITH OPTICAL SHORT-TERM PLASTICITY	115
<i>Xuejun Xie ; Jiahao Kang ; Yongji Gong ; Pulickel M. Ajayan ; Kaustav Banerjee</i>	
5.4 - COEXISTENCE OF VOLATILE AND NON-VOLATILE RESISTIVE SWITCHING IN 2D H- BN BASED ELECTRONIC SYNAPSES.....	119
<i>Y. Shi ; C. Pan ; V. Chen ; N. Raghavan ; K. L. Pey ; F. M. Puglisi ; E. Pop ; H. -S. P. Wong ; M. Lanza</i>	
5.5 - SCALING CARBON NANOTUBE CMOS FETS TOWARDS QUANTUM LIMIT	123
<i>Chenguang Qiu ; Zhiyong Zhang ; Lian-Mao Peng</i>	
5.6 - SOLUTION-PROCESSED CARBON NANOTUBES BASED TRANSISTORS WITH CURRENT DENSITY OF 1.7 MA/μM AND PEAK TRANSCONDUCTANCE OF 0.8 MS/μM	127
<i>Donglai Zhong ; Mengmeng Xiao ; Zhiyong Zhang ; Lian-Mao Peng</i>	
5.7 - BENCHMARKING OF MONOLITHIC 3D INTEGRATED MX2 FETS WITH Si FINFETS.....	131
<i>T. Agarwal ; A. Szabo ; M. G. Bardou ; B. Soree ; I. Radu ; P. Raghavan ; M. Luisier ; W. Dehaene ; M. Heyns</i>	
6.1 - NEUROSIM+: AN INTEGRATED DEVICE-TO-ALGORITHM FRAMEWORK FOR BENCHMARKING SYNAPTIC DEVICES AND ARRAY ARCHITECTURES	135
<i>Pai-Yu Chen ; Xiaochen Peng ; Shimeng Yu</i>	
6.2 - FERROELECTRIC FET ANALOG SYNAPSE FOR ACCELERATION OF DEEP NEURAL NETWORK TRAINING.....	139
<i>Matthew Jerry ; Pai-Yu Chen ; Jianchi Zhang ; Pankaj Sharma ; Kai Ni ; Shimeng Yu ; Suman Datta</i>	

6.3 - RANDOM SPARSE ADAPTATION FOR ACCURATE INFERENCE WITH INACCURATE MULTI-LEVEL RRAM ARRAYS	143
<i>Abinash Mohanty ; Xiaocong Du ; Pai-Yu Chen ; Jae-Sun Seo ; Shimeng Yu ; Yu Cao</i>	
6.4 - TIME-DEPENDENT VARIABILITY IN RRAM-BASED ANALOG NEUROMORPHIC SYSTEM FOR PATTERN RECOGNITION	147
<i>Jian Kang ; Zhizhen Yu ; Lindong Wu ; Yichen Fang ; Zongwei Wang ; Yimao Cai ; Zhigang Ji ; Jianfu Zhang ; Runsheng Wang ; Yuchao Yang ; Ru Huang</i>	
6.5 - FAST, ENERGY-EFFICIENT, ROBUST, AND REPRODUCIBLE MIXED-SIGNAL NEUROMORPHIC CLASSIFIER BASED ON EMBEDDED NOR FLASH MEMORY TECHNOLOGY	151
<i>X. Guo ; F. Merrikh Bayat ; M. Bavandpour ; M. Klachko ; M. R. Mahmoodi ; M. Prezioso ; K. K. Likharev ; D. B. Strukov</i>	
6.6 - DESIGN GUIDELINES OF STOCHASTIC COMPUTING BASED ON FINFET: A TECHNOLOGY-CIRCUIT PERSPECTIVE	155
<i>Yawen Zhang ; Runsheng Wang ; Xiaobo Jiang ; Zhenghan Lin ; Shaofeng Guo ; Zhe Zhang ; Zherui Zhang ; Ru Huang</i>	
7.1 - COMPLETE DEGRADATION MAPPING OF STACKED GATE-ALL-AROUND SI NANOWIRE TRANSISTORS CONSIDERING BOTH INTRINSIC AND EXTRINSIC EFFECTS	159
<i>Adrian Chasin ; Erik Bury ; Ben Kaczer ; Jacopo Franco ; Philippe Roussel ; Romain Ritzenthaler ; Hans Mertens ; Naoto Horiguchi ; Dimitri Linten ; Anda Mocuta</i>	
7.2 - NEW INSIGHTS INTO THE HOT CARRIER DEGRADATION (HCD) IN FINFET: NEW OBSERVATIONS, UNIFIED COMPACT MODEL, AND IMPACTS ON CIRCUIT RELIABILITY	163
<i>Zhuoqing Yu ; Jiayang Zhang ; Runsheng Wang ; Shaofeng Guo ; Changze Liu ; Ru Huang</i>	
7.3 - MODELING OF NBTI TIME KINETICS AND T DEPENDENCE OF VAF IN SIGE P-FINFETS	167
<i>N. Parihar ; R. Southwick ; M. Wang ; J. H. Stathis ; S. Mahapatra</i>	
7.4 - TOWARDS OPTIMAL ESD DIODES IN NEXT GENERATION BULK FINFET AND GAA NW TECHNOLOGY NODES	171
<i>S. -H. Chen ; G. Hellings ; D. Linten ; T. Chiarella ; H. Mertens ; R. Boschke ; J. Mitard ; S. Kubicek ; R. Ritzenthaler ; E. Bury ; N. Wang ; G. Groeseneken ; A. Mocuta ; N. Horiguchi</i>	
7.5 - CHARACTERIZATION OF OXIDE DEFECTS IN INGAAS MOS GATE STACKS FOR HIGH-MOBILITY N-CHANNEL MOSFETS (INVITED)	175
<i>J. Franco ; V. Putcha ; A. Vais ; S. Sioncke ; N. Waldron ; D. Zhou ; G. Rzepa ; Ph. J. Roussel ; G. Groeseneken ; M. Heyns ; N. Collaert ; D. Linten ; T. Grasser ; B. Kaczer</i>	
7.6 - THERMAL EFFECTS IN 3D SEQUENTIAL TECHNOLOGY	179
<i>K. Triantopoulos ; M. Cassé ; L. Brunet ; P. Batude ; C. Fenouillet-Béranger ; B. Mathieu ; M. Vinet ; G. Ghibaudo ; G. Reimbold</i>	
8.1 - FLEXIBLE CMOS ELECTRONICS BASED ON P-TYPE $\text{Ge}_2\text{Sb}_2\text{Te}_5$ AND N-TYPE InGaZnO_4 SEMICONDUCTORS	183
<i>A. Daus ; S. Han ; S. Knobelspies ; G. Cantarella ; C. Vogt ; N. Münzenrieder ; G. Tröster</i>	
8.2 - HIGHLY ROBUST OXIDE THIN FILM TRANSISTORS WITH SPLIT ACTIVE SEMICONDUCTOR AND SOURCE/DRAIN ELECTRODES	187
<i>Suhui Lee ; Di Geng ; Ling Li ; Ming Liu ; Jin Jang</i>	
8.3 - MANUFACTURED-ON-DEMAND STEEP SUBTHRESHOLD ORGANIC FIELD EFFECT TRANSISTOR FOR LOW POWER AND HIGH SENSITIVITY ION AND FLUORESCENCE SENSING	191
<i>J. Zhao ; Q. Li ; Y. Huang ; S. Li ; W. Tang ; S. Peng ; S. Chen ; W. Liu ; X. Guo</i>	
8.4 - BLACK PHOSPHORUS CARBIDE INFRARED PHOTOTRANSISTOR WITH WIDE SPECTRUM SENSING FOR IOT APPLICATIONS	195
<i>Wee Chong Tan ; Li Huang ; Rui Jie Ng ; Lin Wang ; Kah-Wee Ang</i>	
8.5 - THERMALLY STABLE AND FLEXIBLE PAPER PHOTOSENSORS BASED ON 2D BN NANOSHEETS	199
<i>C. H. Lin ; B. Cheng ; M. L. Tsai ; H. C. Fu ; W. Luo ; L. H. Zhou ; S. H. Jang ; L. B. Hu ; J. H. He</i>	
8.6 - HIGH-PERFORMANCE, FLEXIBLE GRAPHENE/ULTRA-THIN SILICON ULTRA-VIOLET IMAGE SENSOR	203
<i>Ayaz Ali ; Khurram Shehzad ; Hongwei Guo ; Zhen Wang ; Peng Wang ; Akeel Qadir ; Weida Hu ; Tianling Ren ; Bin Yu ; Yang Xu</i>	
8.7 - GRAPHENE/SILICON-QUANTUM-DOTS/SI SCHOTTKY-PN CASCADE HETEROJUNCTION FOR SHORT-WAVELENGTH INFRARED PHOTODETECTION	207
<i>Sichao Du ; Zhenyi Ni ; Xuemei Liu ; Hongwei Guo ; Ayaz Ali ; Yang Xu ; Xiaodong Pi</i>	

9.1 - BODY PIN DIODE INACTIVATION WITH LOW ON-RESISTANCE ACHIEVED BY A 1.2 KV-CLASS 4H-SIC SWITCH-MOS	211
<i>Yusuke Kobayashi ; Naoyuki Ohse ; Tadao Morimoto ; Makoto Kato ; Takahito Kojima ; Masaki Miyazato ; Manabu Takei ; Hiroshi Kimura ; Shinsuke Harada</i>	
9.2 - 1200 V GAN VERTICAL FIN POWER FIELD-EFFECT TRANSISTORS	215
<i>Y. Zhang ; M. Sun ; D. Piedra ; J. Hu ; Z. Liu ; Y. Lin ; X. Gao ; K. Shepard ; T. Palacios</i>	
9.3 - DETERMINATION OF INTRINSIC PHONON-LIMITED MOBILITY AND CARRIER TRANSPORT PROPERTY EXTRACTION OF 4H-SIC MOSFETS	219
<i>M. Noguchi ; T. Iwamatsu ; H. Amishiro ; H. Watanabe ; K. Kita ; S. Yamakawa</i>	
9.4 - DEMONSTRATING >1.4 KV OG-FET PERFORMANCE WITH A NOVEL DOUBLE FIELD-PLATED GEOMETRY AND THE SUCCESSFUL SCALING OF LARGE-AREA DEVICES	223
<i>Dong Ji ; Chirag Gupta ; Silvia H. Chan ; Anchal Agarwal ; Wenwen Li ; Stacia Keller ; Umesh K. Mishra ; Srabanti Chowdhury</i>	
9.5 - PROGRESS AND FUTURE CHALLENGES OF SIC POWER DEVICES AND PROCESS TECHNOLOGY	227
<i>T. Kimoto ; H. Niwa ; N. Kaji ; T. Kobayashi ; Y. Zhao ; S. Mori ; M. Aketa</i>	
9.6 - HIGH VOLTAGE VERTICAL P-N DIODES WITH ION-IMPLANTED EDGE TERMINATION AND SPUTTERED SINX PASSIVATION ON GAN SUBSTRATES	231
<i>Jingshan Wang ; Lina Cao ; Jinqiao Xie ; Edward Beam ; Robert McCarthy ; Chris Youtsey ; Patrick Fay</i>	
10.2 - DEVELOPMENT OF HIGH-FREQUENCY BULK ACOUSTIC WAVE (BAW) RESONATORS AS BIOSENSORS AND BIOACTUATORS	235
<i>X. Duan ; S. Pan ; W. Pang</i>	
10.3 - A SINGLE BACTERIUM AND MAMMALIAN CELL ANALYSIS BY IONIC CURRENT MEASUREMENTS IN A MICROCHANNEL	239
<i>N. Kaji ; M. Sano ; S. Ito ; H. Yasaki ; T. Yasui ; H. Yukawa ; Y. Baba</i>	
10.4 - RAPID ANTIBIOTIC SUSCEPTIBILITY TESTING SYSTEM: LIFE SAVING BIOMEMS DEVICES	243
<i>H. Y. Jeong ; E. -G. Kim ; S. Han ; G. Y. Lee ; S. Han ; B. Jin ; T. Lim ; H. C. Kim ; T. S. Kim ; D. Y. Kim ; S. Kwon</i>	
10.5 - MICROSCALE PROFILING OF CIRCULATING TUMOR CELLS	247
<i>Reza Mohamadi ; Shana Kelley</i>	
10.6 - ENCAPSULATED ORGANOID & ORGAN-ON-A-CHIP PLATFORM FOR CANCER MODELING	251
<i>N. Picollet-D'Hahan ; B. Laperrousaz ; S. Porte ; P. Obeid ; A. Tollance ; F. Kermarrec ; C. Belda-Marin ; A. Romero-Millan ; V. Haguet ; D. K. Martin ; X. Gidrol</i>	
10.7 - TISSUE MICROENVIRONMENT AND CELLULAR IMAGING	255
<i>S. S. Nasseri ; S. M. Grist ; S. Chen ; Y. Y. Tam ; P. Cullis ; K. C. Cheung</i>	
11.1 - STOCHASTIC SYNAPSES AS RESOURCE FOR EFFICIENT DEEP LEARNING MACHINES	259
<i>Emre Neftci</i>	
11.2 - ATTRACTOR NETWORKS AND ASSOCIATIVE MEMORIES WITH STDP LEARNING IN RRAM SYNAPSES	263
<i>V. Milo ; D. Ielmini ; E. Chicca</i>	
11.3 - ENERGY USE CONSTRAINS BRAIN INFORMATION PROCESSING	267
<i>Mireille Conrad ; Elisabeth Engl ; Renaud B. Jolivet</i>	
11.4 - UNDERSTANDING THE TRADE-OFFS OF DEVICE, CIRCUIT AND APPLICATION IN RERAM-BASED NEUROMORPHIC COMPUTING SYSTEMS	270
<i>Bonan Yan ; Chenchen Liu ; Xiaoxiao Liu ; Yiran Chen ; Hai Li</i>	
11.5 - DEVICE AND CIRCUIT OPTIMIZATION OF RRAM FOR NEUROMORPHIC COMPUTING	274
<i>Huaqiang Wu ; Peng Yao ; Bin Gao ; Wei Wu ; Qingtian Zhang ; Wenqiang Zhang ; Ning Deng ; Dong Wu ; H. -S. Philip Wong ; Shimeng Yu ; He Qian</i>	
11.6 - CHALLENGES AND OPPORTUNITIES TOWARD ONLINE TRAINING ACCELERATION USING RRAM-BASED HARDWARE NEURAL NETWORK	278
<i>Chih-Cheng Chang ; Jen-Chieh Liu ; Yu-Lin Shen ; Teyuh Chou ; Pin-Chun Chen ; I. -Ting Wang ; Chih-Chun Su ; Ming-Hong Wu ; Boris Hudec ; Che-Chia Chang ; Chia-Ming Tsai ; Tian-Sheuan Chang ; H. -S. Philip Wong ; Tuo-Hung Hou</i>	
11.7 - MULTISCALE MODELING OF NEUROMORPHIC COMPUTING: FROM MATERIALS TO DEVICE OPERATIONS	282
<i>Luca Larcher ; Andrea Padovani ; Valerio Di Lecce</i>	
12.1 - TWIN MODE NV LOGIC GATES FOR HIGH SPEED COMPUTING SYSTEM ON 16NM FINFET CMOS LOGIC PROCESS	286
<i>Wei-Yu Chien ; Tai-Min Wang ; Yue-Der Chih ; Jonathan Chang ; Chrong Jung Lin ; Ya-Chin King</i>	

12.2 - A NOVEL PUF AGAINST MACHINE LEARNING ATTACK: IMPLEMENTATION ON A 16 MB RRAM CHIP	290
Yachuan Pang ; Huaqiang Wu ; Bin Gao ; Dong Wu ; An Chen ; He Qian	
12.3 - LARGE-SCALE TERAHERTZ ACTIVE ARRAYS IN SILICON USING HIGHLY-VERSATILE ELECTROMAGNETIC STRUCTURES	294
Cheng Wang ; Zhi Hu ; G. Zhang ; J. Holloway ; Ruonan Han	
12.4 - VARIABILITY-AND RELIABILITY-AWARE DESIGN FOR 16/14NM AND BEYOND TECHNOLOGY	298
R. Huang ; X. B. Jiang ; S. F. Guo ; P. P. Ren ; P. Hao ; Z. Q. Yu ; Z. Zhang ; Y. Y. Wang ; R. S. Wang	
12.5 - A NOVEL BIT-LEVEL CHARACTERIZATION METHODOLOGY TO BENCHMARK THE FINFET BASED SRAM PERFORMANCE UNDER THE INFLUENCE OF LEAKAGE CURRENT	302
J. C. Liu ; S. Mukhopadhyay ; Y. F. Wang ; Y. S. Tsai ; S. C. Chen ; J. H. Lee ; Ryan Lu ; Y. -H. Lee ; Jun He	
12.6 - TSV-FREE FINFET-BASED MONOLITHIC 3D+-IC WITH COMPUTING-IN-MEMORY SRAM CELL FOR INTELLIGENT IOT DEVICES.....	306
Fu-Kuo Hsueh ; Hsiao-Yun Chiu ; Chang-Hong Shen ; Jia-Min Shieh ; Ying-Tsan Tang ; Chih-Chao Yang ; Hsiu-Chih Chen ; Wen-Hsien Huang ; Bo-Yuan Chen ; Kun-Ming Chen ; Guo-Wei Huang ; Wei-Hao Chen ; Kuo-Hsiang Hsu ; Srivatsa Rangachar Srinivasa ; Nicholas Jao ; Albert Lee ; Hochul Lee ; Vijaykrishnan Narayanan ; Kang-Lung Wang ; Meng-Fan Chang ; Wen-Kuan Yeh	
13.1 - HOT-CARRIER DEGRADATION IN FINFETS: MODELING, PECULIARITIES, AND IMPACT OF DEVICE TOPOLOGY	310
A. Makarov ; S. E. Tyaginov ; B. Kaczer ; M. Jech ; A. Chasin ; A. Grill ; G. Hellings ; M. I. Vexler ; D. Linten ; T. Grasser	
13.2 - PERFORMANCE COMPARISON FOR FINFETS, NANOWIRE AND STACKED NANOWIRES FETS: FOCUS ON THE INFLUENCE OF SURFACE ROUGHNESS AND THERMAL EFFECTS.....	314
O. Badami ; F. Driussi ; P. Palestri ; L. Selmi ; D. Esseni	
13.3 - MONTE CARLO BENCHMARK OF $\text{IN}_{0.53}\text{GA}_{0.47}\text{AS}$-AND SILICON-FINFETS	318
F. M. Bufler ; G. Eneman ; N. Collaert ; A. Mocuta	
13.4 - MODELLING NANOSCALE N-MOSFETS WITH III-V COMPOUND SEMICONDUCTOR CHANNELS: FROM ADVANCED MODELS FOR BAND STRUCTURES, ELECTROSTATICS AND TRANSPORT TO TCAD	322
L. Selmi ; E. Caruso ; S. Carapezz ; M. Visciarelli ; E. Gnani ; N. Zagni ; P. Pavan ; P. Palestri ; D. Esseni ; A. Gnudi ; S. Reggiani ; F. M. Puglisi ; G. Verzellesi	
13.5 - FERROELECTRIC TRANSISTOR MODEL BASED ON SELF-CONSISTENT SOLUTION OF 2D POISSON'S, NON-EQUILIBRIUM GREEN'S FUNCTION AND MULTI-DOMAIN LANDAU KHALATNIKOV EQUATIONS.....	326
A. K. Saha ; P. Sharma ; I. Dabo ; S. Datta ; S. K. Gupta	
13.6 - A NEW FRAMEWORK OF PHYSICS-BASED COMPACT MODEL PREDICTS RELIABILITY OF SELF-HEATED MODERN ICS: FINFET, NWFET, NSHFET COMPARISON	330
Woojin Ahn ; Chunsheng Jiang ; Jun Xu ; Muhammad Ashraful Alam	
14.1 - 20 YEARS OF CU BEOL IN MANUFACTURING, AND ITS FUTURE PROSPECTS	334
Daniel C. Edelstein	
14.2 - FULLY ALIGNED VIA INTEGRATION FOR EXTENDIBILITY OF INTERCONNECTS TO BEYOND THE 7 NM NODE.....	338
Benjamin D. Briggs ; C. B. Peethala ; D. L. Rath ; J. Lee ; S. Nguyen ; N. V. Licausi ; P. S. McLaughlin ; H. You ; D. Sil ; N. A. Lanzillo ; H. Huang ; R. Patlolla ; T. Haigh ; Y. Xu ; C. Park ; P. Kerber ; H. K. Shobha ; Y. Kim ; J. Demarest ; J. Li ; G. Lian ; M. Ali ; C. T. Le ; E. T. Ryan ; L. A. Clevenger ; D. F. Canaperi ; T. E. Standaert ; G. Bonilla ; E. Huang	
14.3 - ALL-CARBON INTERCONNECT SCHEME INTEGRATING GRAPHENE-WIRES AND CARBON-NANOTUBE-VIAS	342
Junkai Jiang ; Jiahao Kang ; Jae Hwan Chu ; Kaustav Banerjee	
14.4 - CONTINUING MOORE'S LAW WITH EUV LITHOGRAPHY	346
B. Turkot ; S. Carson ; A. Lio	
14.5 - ELECTRON BEAM DETECTION OF COBALT TRENCH EMBEDDED VOIDS ENABLING IMPROVED PROCESS CONTROL FOR MIDDLE-OF-LINE AT THE 7NM NODE AND BEYOND	349
N. Breil ; D. Shemesh ; J. Fernandez ; R. Hung ; N. Bekiaris ; J. Tseng ; M. Naik ; J. H. Park ; J. Bakke ; A. Kumar ; K. Nafisi ; A. Litman ; A. Karnieli ; V. Kuchik ; A. Wachs ; N. Khasgiwale ; M. Chudzik	
14.6 - IMPROVEMENT OF HFO₂ BASED RRAM ARRAY PERFORMANCES BY LOCAL SI IMPLANTATION	353
M. Barlas ; A. Grossi ; L. Grenouillet ; E. Vianello ; E. Nolot ; N. Vaxelaire ; P. Blaise ; B. Traoré ; J. Coignus , F. Perrin ; R. Crochemore ; F. Mazen ; L. Lachal ; S. Pauliac ; C. Pellissier ; S. Bernasconi ; S. Chevalliez ; J. F. Nodin ; L. Perniola ; E. Nowak	

15.1 - 14NM FERROELECTRIC FINFET TECHNOLOGY WITH STEEP SUBTHRESHOLD SLOPE FOR ULTRA LOW POWER APPLICATIONS	357
Z. Krivokapic ; U. Rana ; R. Galatage ; A. Razavieh ; A. Aziz ; J. Liu ; J. Shi ; H. J. Kim ; R. Sporer ; C. Serrao ; A. Busquet ; P. Polakowski ; J. Müller ; W. Kleemeier ; A. Jacob ; D. Brown ; A. Knorr ; R. Carter ; S. Banna	
15.2 - PERSPECTIVE OF NEGATIVE CAPACITANCE FINFETS INVESTIGATED BY TRANSIENT TCAD SIMULATION	361
Hiroyuki Ota ; Koichi Fukuda ; Tsutomu Ikegami ; Junichi Hattori ; Hidehiro Asai ; Shinji Migita ; Akira Toriumi	
15.3 - HYSTERESIS-FREE NEGATIVE CAPACITANCE GERMANIUM CMOS FINFETS WITH BI-DIRECTIONAL SUB-60 MV/DEC	365
Wonil Chung ; Mengwei Si ; Peide D. Ye	
15.4 - GE NANOWIRE FETS WITH HFZROX FERROELECTRIC GATE STACK EXHIBITING SS OF SUB-60 MV/DEC AND BIASING EFFECTS ON FERROELECTRIC RELIABILITY	369
C. -J. Su ; T. -C. Hong ; Y. -C. Tsou ; F. -J. Hou ; P. -J. Sung ; M. -S. Yeh ; C. -C. Wan ; K. -H. Kao ; Y. -T. Tang ; C. -H. Chiu ; C. -J. Wang ; S. -T. Chung ; T. -Y. You ; Y. -C. Huang ; C. -T. Wu ; K. -L. Lin ; G. -L. Luo ; K. -P. Huang ; Y. -J. Lee ; T. -S. Chao ; W. -F. Wu ; G. -W. Huang ; J. -M. Shieh ; W. -K. Yeh ; Y. -H. Wang	
15.5 - FREQUENCY DEPENDENCE OF PERFORMANCE IN GE NEGATIVE CAPACITANCE PFETS ACHIEVING SUB-30 MV/DECADE SWING AND 110 MV HYSTERESIS AT MHZ	373
Jiuren Zhou ; Jibao Wu ; Genquan Han ; Ruoying Kanyang ; Yue Peng ; Jing Li ; Hongjuan Wang ; Yan Liu ; Jincheng Zhang ; Qing-Qing Sun ; David Wei Zhang ; Yue Hao	
15.6 - PROPOSAL AND DEMONSTRATION OF OXIDE-SEMICONDUCTOR/(SI, SIGE, GE) BILAYER TUNNELING FIELD EFFECT TRANSISTOR WITH TYPE-II ENERGY BAND ALIGNMENT	377
K. Kato ; H. Matsui ; H. Tabata ; M. Takenaka ; S. Takagi	
15.7 - CRYSTAL-ORIENTED BLACK PHOSPHORUS TFETS WITH STRONG BAND-TO-BAND-TUNNELING ANISOTROPY AND SUBTHRESHOLD SLOPE NEARING THE THERMIonic LIMIT	381
Matthew C. Robbins ; Steven J. Koester	
16.1 - AN EXPERIMENTAL CMOS PHOTON DETECTOR WITH 0.5E-RMS TEMPORAL NOISE AND 15μM PITCH ACTIVE SENSOR PIXELS	385
T. Nishihara ; M. Matsumura ; T. Imoto ; K. Okumura ; Y. Sakano ; Y. Yorikado ; Y. Tashiro ; H. Wakabayashi ; Y. Oike ; Y. Nitta	
16.2 - SOI MONOLITHIC PIXEL TECHNOLOGY FOR RADIATION IMAGE SENSOR	389
Y. Arai ; T. Miyoshi ; I. Kurachi	
16.3 - BACK-SIDE ILLUMINATED GESN PHOTODIODE ARRAY ON QUARTZ SUBSTRATE FABRICATED BY LASER-INDUCED LIQUID-PHASE CRYSTALLIZATION FOR MONOLITHICALLY-INTEGRATED NIR IMAGER CHIP	393
H. Oka ; K. Inoue ; T. T. Nguyen ; S. Kuroki ; T. Hosoi ; T. Shimura ; H. Watanabe	
16.4 - NEAR-INFRARED SENSITIVITY ENHANCEMENT OF A BACK-ILLUMINATED COMPLEMENTARY METAL OXIDE SEMICONDUCTOR IMAGE SENSOR WITH A PYRAMID SURFACE FOR DIFFRACTION STRUCTURE	397
I. Oshiyama ; S. Yokogawa ; H. Ikeda ; Y. Ebiko ; T. Hirano ; S. Saito ; T. Oinoue ; Y. Hagimoto ; H. Iwamoto	
16.5 - INDUSTRIALISED SPAD IN 40 NM TECHNOLOGY	401
S. Pellegrini ; B. Rae ; A. Pingault ; D. Golanski ; S. Jouan ; C. Lapeyre ; B. Mamdy	
16.6 - A BACK-ILLUMINATED 3D-STACKED SINGLE-PHOTON AVALANCHE DIODE IN 45NM CMOS TECHNOLOGY	405
M. -J. Lee ; A. R. Ximenes ; P. Padmanabhan ; T. J. Wang ; K. C. Huang ; Y. Yamashita ; D. N. Yaung ; E. Charbon	
17.1 - RECORD PERFORMANCE TOP-DOWN IN0.53GA0.47AS VERTICAL NANOWIRE FETS AND VERTICAL NANOSHEETS	409
S. Ramesh ; Ts. Ivanov ; V. Putcha ; A. Alian ; A. Sibaja-Hernandez ; R. Rooyackers ; E. Camerotto ; A. Milenin ; N. Pinna ; S. El Kazzi ; A. Veloso ; D. Lin ; P. Lagrain ; P. Favia ; N. Collaert ; K. De Meyer	
17.2 - SUB-10 NM DIAMETER INGAAS VERTICAL NANOWIRE MOSFETS	413
X. Zhao ; C. Heidelberger ; E. A. Fitzgerald ; W. Lu ; A. Vardi ; J. A. Del Alamo	
17.3 - SUB-100-NM GATE-LENGTH SCALING OF VERTICAL INAS/INGAAS NANOWIRE MOSFETS ON SI	417
Olli-Pekka Kilpi ; Johannes Svensson ; Lars-Erik Wernersson	
17.4 - HIGH MOBILITY IN0.30GA0.70AS MOSHEMTS ON LOW THREADING DISLOCATION DENSITY 200 MM SI SUBSTRATES: A TECHNOLOGY ENABLER TOWARDS HETEROGENEOUS INTEGRATION OF LOW NOISE AND MEDIUM POWER AMPLIFIERS WITH SI CMOS	421
Sachin Yadav ; Annie Kumar ; Xuan Sang Nguyen ; Kwang Hong Lee ; Zhihong Liu ; Weichuan Xing ; Saeid Masudy-Panah ; Kenneth Lee ; Chuan Seng Tan ; Eugene A. Fitzgerald ; Dimitri A. Antoniadis ; Yee-Chia Yeo ; Xiao Gong	

17.5 - A SCALED REPLACEMENT METAL GATE INGAAS-ON-INSULATOR N-FINFET ON SI WITH RECORD PERFORMANCE	425
<i>H. Hahn ; V. Deshpande ; E. Caruso ; S. Sant ; E. O'Connor ; Y. Baumgartner ; M. Sousa ; D. Caimi ; A. Olziersky ; P. Palestri ; L. Selmi ; A. Schenk ; L. Czornomaz</i>	
17.6 - SELF-ALIGNED INGAAS FINFETS WITH 5-NM FIN-WIDTH AND 5-NM GATE-CONTACT SEPARATION	429
<i>Alon Vardi ; Lisa Kong ; Wenjie Lu ; Xiaowei Cai ; Xin Zhao ; Jesús Grajal ; Jesús A. Del Alamo</i>	
17.7 - 10-NM FIN-WIDTH INGASB P-CHANNEL SELF-ALIGNED FINFETS USING ANTIMONIDE-COMPATIBLE DIGITAL ETCH	433
<i>W. Lu ; I. P. Roh ; D. -M. Geum ; S. -H. Kim ; J. D. Song ; L. Kong ; J. A. Del Alamo</i>	
18.1 - LAB ON SKIN™: 3D MONOLITHICALLY INTEGRATED ZERO-ENERGY MICRO/NANOFLUIDICS AND FD SOI ION SENSITIVE FETS FOR WEARABLE MULTI-SENSING SWEAT APPLICATIONS	437
<i>F. Bellando ; E. Garcia-Cordero ; F. Wildhaber ; J. Longo ; H. Guérin ; A. M. Ionescu</i>	
18.2 - SKIN-LIKE NANOSTRUCTURED BIOSENSOR SYSTEM FOR NONINVASIVE BLOOD GLUCOSE MONITORING	441
<i>Yihao Chen ; Siyuan Lu ; Xue Feng</i>	
18.3 - MECHANICAL-FIELD-COUPLED THIN-FILM TRANSISTOR FOR TACTILE SENSING WITH MN DYNAMIC FORCE DETECTION CAPABILITY AND WEARABLE SELF-DRIVEN HEART RATE MONITORING WITH μW POWER CONSUMPTION	445
<i>Weili Li ; Ahmed Rasheed ; Xiao Feng ; Emad Iranmanesh ; Kai Wang ; Hai Ou ; Jun Chen ; Shaozhi Deng ; Ningsheng Xu</i>	
18.4 - ENERGY-EFFICIENT ALL FIBER-BASED LOCAL BODY HEAT MAPPING CIRCUITRY COMBINING THERMISTOR AND MEMRISTOR FOR WEARABLE HEALTHCARE DEVICE	449
<i>Hagyoul Bae ; Weon-Guk Kim ; Hongkeun Park ; Seung-Bae Jeon ; Soo-Ho Jung ; Hye Moon Lee ; Myung-Su Kim ; Il-Woong Tcho ; Byung Chul Jang ; Hwon Im ; Sung-Yool Choi ; Sung Gap Im ; Yang-Kyu Choi</i>	
18.5 - 3D HETEROGENEOUS INTEGRATED MONOLAYER GRAPHENE SI-CMOS RF GAS SENSOR PLATFORM	453
<i>M. Holt ; S. M. Mortazavi Zanjani ; M. M. Sadeghi ; D. Akinwande</i>	
18.6 - TWO-DIMENSIONAL SNS2 FOR DETECTING GASES CAUSING “SICK BUILDING SYNDROME”	457
<i>K. Hayashi ; M. Kataoka ; H. Jippo ; M. Ohfuchi ; T. Iwai ; S. Sato</i>	
19.1 - A 128GB (MLC)/192GB (TLC) SINGLE-GATE VERTICAL CHANNEL (SGVC) ARCHITECTURE 3D NAND USING ONLY 16 LAYERS WITH ROBUST READ DISTURB, LONG-RETENTION AND EXCELLENT SCALING CAPABILITY	461
<i>Hang-Ting Lue ; Pei-Ying Du ; Wei-Chen Chen ; Yung-Chun Lee ; Tzu-Hsuan Hsu ; Teng-Hao Yeh ; Kuo-Pin Chang ; Chih-Chang Hsieh ; Chiataze Huang ; Guan-Ru Lee ; Chih-Ping Chen ; Chieh-Fang Chen ; Chia-Jung Chiu ; Y. J. Chen ; W. P. Lu ; Tahone Yang ; Kuang-Chao Chen ; Chun-Hsiung Hung ; Keh-Chung Wang ; Chih-Yuan Lu</i>	
19.2 - LATERAL CHARGE MIGRATION SUPPRESSION OF 3D-NAND FLASH BY V_{TH} NEARING FOR NEAR DATA COMPUTING	465
<i>Kyoji Mizoguchi ; Shohei Kotaki ; Yoshiaki Deguchi ; Ken Takeuchi</i>	
19.3 - RELIABILITY AND SCALABILITY OF FINFET SPLIT-GATE MONOS ARRAY WITH TIGHT VTH DISTRIBUTION FOR 16/14NM-NODE EMBEDDED FLASH	469
<i>S. Tsuda ; T. Saito ; H. Nagase ; Y. Kawashima ; A. Yoshitomi ; S. Okanishi ; T. Hayashi ; T. Maruyama ; M. Inoue ; S. Muranaka ; S. Kato ; T. Hagiwara ; H. Saito ; T. Yamaguchi ; M. Kadoshima ; T. Maruyama ; T. Mihara ; H. Yanagita ; K. Sonoda ; T. Yamashita ; Y. Yamaguchi</i>	
19.4 - ADVANCED MEMORY SOLUTIONS FOR EMERGING CIRCUITS AND SYSTEMS	473
<i>B. Giraud ; A. Makosiej ; R. Boumchedda ; N. Gupta ; A. Levisse ; E. Vianello ; J. -P. Noel</i>	
19.5 - 2D MOLYBDENUM DISULFIDE (MOS2) TRANSISTORS DRIVING RRAMS WITH 1T1R CONFIGURATION	477
<i>Rui Yang ; Haitong Li ; Kirby K. H. Smithe ; Taeho R. Kim ; Kye Okabe ; Eric Pop ; Jonathan A. Fan ; H. -S. Philip Wong</i>	
19.6 - ENGINEERING OF FERROELECTRIC SWITCHING SPEED IN SI DOPED HFO₂ FOR HIGH-SPEED 1T-FERAM APPLICATION	481
<i>H. K. Yoo ; J. S. Kim ; Z. Zhu ; Y. S. Choi ; A. Yoon ; M. R. Macdonald ; X. Lei ; T. Y. Lee ; D. Lee ; S. C. Chae ; J. Park ; D. Hemker ; J. G. Langan ; Y. Nishi ; S. J. Hong</i>	
19.7 - A FEFET BASED SUPER-LOW-POWER ULTRA-FAST EMBEDDED NVM TECHNOLOGY FOR 22NM FDSOI AND BEYOND	485
<i>S. Dünkel ; M. Trentzsch ; R. Richter ; P. Moll ; C. Fuchs ; O. Gehring ; M. Majer ; S. Wittek ; B. Müller ; T. Melde ; H. Mulaosmanovic ; S. Slesazeck ; S. Müller ; J. Ocker ; M. Noack ; D. -A. Löhr ; P. Polakowski ; J. Müller ; T. Mikolajick ; J. Höntschele ; B. Rice ; J. Pellerin ; S. Beyer</i>	

20.1 - OVERCOMING INTERCONNECT SCALING CHALLENGES USING NOVEL PROCESS AND DESIGN SOLUTIONS TO IMPROVE BOTH HIGH-SPEED AND LOW-POWER COMPUTING MODES	489
Kaushik Vaidyanathan ; Daniel H. Morris ; Uygar E. Avci ; Ishwar S. Bhati ; Lavanya Subramanian ; Jayesh Gaur ; Huichu Liu ; Sreenivas Subramoney ; Tanay Karnik ; Hong Wang ; Ian A. Young	
20.2 - IMPACT OF AGGRESSIVE FIN WIDTH SCALING ON FINFET DEVICE CHARACTERISTICS	493
X. He ; J. Fronheiser ; P. Zhao ; Z. Hu ; S. Uppal ; X. Wu ; Y. Hu ; R. Sporer ; L. Qin ; R. Krishnan ; E. M. Bazizi ; R. Carter ; K. Tabakman ; A. K. Jha ; H. Yu ; O. Hu ; D. Choi ; J. G. Lee ; S. B. Samavedam ; D. K. Sohn	
20.3 - DESIGN TECHNOLOGY CO-OPTIMIZATION OF 3D-MONOLITHIC STANDARD CELLS AND SRAM EXPLOITING DYNAMIC BACK-BIAS FOR ULTRA-LOW-VOLTAGE OPERATION	497
F. Andrieu ; R. Berthelon ; R. Boumchedda ; G. Tricaud ; L. Brunet ; P. Batude ; B. Mathieu ; E. Avelar ; A. Ayres De Sousa ; G. Cibrario ; O. Rozeau ; J. Lacord ; O. Billoint ; C. Fenouillet-Béranger ; S. Guissi ; D. Fried ; P. Morin ; J. P. Noel ; B. Giraud ; S. Thuries ; F. Arnaud ; M. Vinet	
20.4 - POWER AWARE FINFET AND LATERAL NANOSHEET FET TARGETING FOR 3NM CMOS TECHNOLOGY	501
D. Yakimets ; M. Garcia Bardon ; D. Jang ; P. Schuddinck ; Y. Sherazi ; P. Weckx ; K. Miyaguchi ; B. Parvais ; P. Raghavan ; A. Spessot ; D. Verkest ; A. Mocuta	
20.5 - STACKED NANOSHEET FORK ARCHITECTURE FOR SRAM DESIGN AND DEVICE CO-OPTIMIZATION TOWARD 3NM	505
P. Weckx ; J. Ryckaert ; V. Putcha ; A. De Keersgieter ; J. Boemmel ; P. Schuddinck ; D. Jang ; D. Yakimets ; M. G. Bardon ; L. -å. Ragnarsson ; P. Raghavan ; R. R. Kim ; A. Spessot ; D. Verkest ; A. Mocuta	
20.6 - A NOVEL PERFORMANCE MODEL FOR STATE-OF-THE-ART PROCESSORS BY MODERNIZATION OF RENT'S RULE	509
D. Prasad ; S. Sinha ; B. Cline ; S. Moore ; A. Naeemi	
21.1 - IMPACT OF EXTERNAL MAGNETIC FIELD ON EMBEDDED PERPENDICULAR STT-MRAM TECHNOLOGY QUALIFIED FOR SOLDER REFLOW	513
Chia-Yu Wang ; Meng-Chun Shih ; Yung-Huei Lee ; Wayne Wang ; Luc Thomas ; Yuan-Jen Lee ; Huanlong Liu ; Jian Zhu ; Guenole Jan ; Allen Wang ; Tom Zhong ; Po-Kang Wang ; Derek Lin ; Chia-Hsiang Chen ; Chih-Yang Chang ; Chih-Hui Weng ; Tien-Wei Chiang ; Kuei-Hung Shen ; William J. Gallagher ; Harry Chuang	
21.2 - EXPERIMENTAL AND THEORETICAL VERIFICATION OF CHANNEL CONDUCTIVITY DEGRADATION DUE TO GRAIN BOUNDARIES AND DEFECTS IN 3D NAND	517
A. Subirats ; A. Arreghini ; E. Capogreco ; R. Delhougne ; C. -L. Tan ; A. Hikavyy ; L. Breuil ; R. Degraeve ; V. Putcha ; G. Van Den Bosch ; D. Linten ; A. Furnémont	
21.3 - IMPACT OF TEMPERATURE ON THE AMPLITUDE OF RTN FLUCTUATIONS IN 3-D NAND FLASH CELLS	521
G. Nicosia ; A. Mannara ; D. Resnati ; G. M. Paolucci ; P. Tessariol ; A. L. Lacaita ; A. S. Spinelli ; A. Goda ; C. Monzio Compagnoni	
21.4 - RTN BASED OXYGEN VACANCY PROBING METHOD FOR OX-RRAM RELIABILITY CHARACTERIZATION AND ITS APPLICATION IN TAIL BITS	525
P. Huang ; D. B. Zhu ; C. Liu ; Z. Zhou ; Z. Dong ; H. Jiang ; W. S. Shen ; L. F. Liu ; X. Y. Liu ; J. F. Kang	
21.5 - FUNDAMENTAL LIMITATIONS OF EXISTING MODELS AND FUTURE SOLUTIONS FOR DIELECTRIC RELIABILITY AND RRAM APPLICATIONS (INVITED)	529
E. Wu ; A. Kim ; T. Ando ; R. Muralidhar ; B. Li ; R. Southwick ; P. Jamison ; T. Shaw ; J. Stathis ; G. Bonilla	
21.6 - OVERCOMING THE RELIABILITY LIMITATION IN THE ULTIMATELY SCALED DRAM USING SILICON MIGRATION TECHNIQUE BY HYDROGEN ANNEALING	533
Seong-Wan Ryu ; Kyungkyu Min ; Jungho Shin ; Heimi Kwon ; Donghoon Nam ; Taekyung Oh ; Tae-Su Jang ; Minsoo Yoo ; Yongtaik Kim ; Sungjoo Hong	
22.1 - HIGH-K METAL GATE FUNDAMENTAL LEARNING AND MULTI-VT OPTIONS FOR STACKED NANOSHEET GATE-ALL-AROUND TRANSISTOR	537
Jingyun Zhang ; Takashi Ando ; Chun Wing Yeung ; Miaomiao Wang ; Ohseong Kwon ; Rohit Galatage ; Robin Chao ; Nicolas Loubet ; Bum Ki Moon ; Ruqiang Bao ; Reinaldo A. Vega ; Juntao Li ; Chen Zhang ; Zuoguang Liu ; Myunggil Kang ; Xin Miao ; Junli Wang ; Sivananda Kanakasabapathy ; Veeraraghavan S. Basker ; Hemanth Jagannathan ; Tenko Yamashita	
22.2 - HIGHLY CONDUCTIVE METAL GATE FILL INTEGRATION SOLUTION FOR EXTREMELY SCALED RMG STACK FOR 5 NM & BEYOND	541
N. Yoshida ; S. Hassan ; W. Tang ; Y. Yang ; W. Zhang ; S. C. Chen ; L. Dong ; H. Zhou ; M. Jin ; M. Okazaki ; J. Park ; N. Bekiaris ; R. Hung ; J. Zhou ; Y. Lei ; P. Ma ; X. Tang ; T. Miyashita ; N. Kim ; E. Yieh	

22.3 - INTEGRATED DUAL SPE PROCESSES WITH LOW CONTACT RESISTIVITY FOR FUTURE CMOS TECHNOLOGIES	545
<i>Heng Wu ; Soon-Cheon Seo ; Chengyu Niu ; Wei Wang ; Gen Tsutsui ; Oleg Gluschenkov ; Zuoguang Liu ; Alexandru Petrescu ; Adra Carr ; Sam Choi ; Stan Tsai ; Chanro Park ; Indira Seshadri ; Anuja Desilva ; Abraham Arceo ; George Yang ; Muthumanickam Sankarapandian ; Chris Prindle ; Kerem Akarvardar ; Curtis Durfee ; Jie Yang ; Praneet Adusumilli ; Bruce Miao ; Jay Strange ; Walter Kleemeier ; Mark Raymond ; Kisik Choi ; Fee-Li Lie ; Tenko Yamashita ; Andreas Knorr ; Dinesh Gupta ; Dechao Guo ; Rama Divakaruni ; Huiming Bu ; Mukesh Khare</i>	
22.4 - COMPREHENSIVE STUDY OF GA ACTIVATION IN SI, SIGE AND GE WITH 5×10^{-10} $\Omega \cdot \text{cm}^2$ CONTACT RESISTIVITY ACHIEVED ON GA DOPED GE USING NANOSECOND LASER ACTIVATION	549
<i>Lin-Lin Wang ; Hao Yu ; M. Schaekers ; J.-L. Everaert ; A. Franquet ; B. Douhard ; L. Date ; J. Del Agua Borniquel ; K. Hollar ; F. A. Khaja ; W. Aderhold ; A. J. Mayur ; J. Y. Lee ; H. Van Meer ; D. Mocuta ; N. Horiguchi ; N. Collaert ; K. De Meyer ; Yu-Long Jiang</i>	
22.5 - CLUSTER-PREFORMING-DEPOSITED AMORPHOUS WSi_N (N = 12) INSERTION FILM OF LOW SBH AND HIGH DIFFUSION BARRIER FOR DIRECT CU CONTACT	553
<i>Naoya Okada ; Noriyuki Uchida ; Sinichi Ogawa ; Kazuhiko Endo ; Toshihiko Kanayama</i>	
23.1 - NEGATIVE CAPACITANCE ENABLES FINFET AND FD-SOI SCALING TO 2 NM NODE	557
<i>Vita Pi-Ho Hu ; Pin-Chieh Chiu ; Angada B. Sachid ; Chenming Hu</i>	
23.2 - ENERGY-EFFICIENT HFAlO_X NCFET: USING GATE STRAIN AND DEFECT PASSIVATION TO REALIZE NEARLY HYSTERESIS-FREE SUB-25MV/DEC SWITCH WITH ULTRALOW LEAKAGE	561
<i>Chia-Chi Fan ; Chun-Hu Cheng ; Yi-Ru Chen ; Chien Liu ; Chun-Yen Chang</i>	
23.3 - FERROELECTRIC AL:HFO₂ NEGATIVE CAPACITANCE FETS	565
<i>M. H. Lee ; P. -G. Chen ; S. -T. Fan ; Y. -C. Chou ; C. -Y. Kuo ; C. -H. Tang ; H. -H. Chen ; S. -S. Gu ; R. -C. Hong ; Z. -Y. Wang ; S. -Y. Chen ; C. -Y. Liao ; K. -T. Chen ; S. T. Chang ; M. -H. Liao ; K. -S. Li ; C. W. Liu</i>	
23.4 - PHYSICS AND TECHNOLOGY OF ELECTRONIC INSULATOR-TO-METAL TRANSITION (E-IMT) FOR RECORD HIGH ON/OFF RATIO AND LOW VOLTAGE IN DEVICE APPLICATIONS	569
<i>Jianqiang Lin ; Khan Alam ; Leonidas Ocola ; Zhen Zhang ; Suman Datta ; Shriram Ramanathan ; Supratik Guha</i>	
23.5 - SUB-60 MV/DEC FERROELECTRIC HZO MOS₂ NEGATIVE CAPACITANCE FIELD-EFFECT TRANSISTOR WITH INTERNAL METAL GATE: THE ROLE OF PARASITIC CAPACITANCE	573
<i>M. Si ; C. Jiang ; C. -J. Su ; Y. -T. Tang ; L. Yang ; W. Chung ; M. A. Alam ; P. D. Ye</i>	
23.6 - NEGATIVE CAPACITANCE 2D MOS₂ TRANSISTORS WITH SUB-60MV/DEC SUBTHRESHOLD SWING OVER 6 ORDERS, 250 $\mu\text{A}/\mu\text{m}$ CURRENT DENSITY, AND NEARLY-HYSTERESIS-FREE	577
<i>Zhihao Yu ; Hanchen Wang ; Weisheng Li ; Sheng Xu ; Xiongfei Song ; Shuxian Wang ; Peng Wang ; Peng Zhou ; Yi Shi ; Yang Chai ; Xinran Wang</i>	
23.7 - NBO₂ BASED THRESHOLD SWITCH DEVICE WITH HIGH OPERATING TEMPERATURE (>85 °C) FOR STEEP-SLOPE MOSFET (~2MV/DEC) WITH ULTRA-LOW VOLTAGE OPERATION AND IMPROVED DELAY TIME	581
<i>Jaehyuk Park ; Dongwook Lee ; Jongmyung Yoo ; Hyunsang Hwang</i>	
24.1 - HYBRID III-V/SI DBF LASER INTEGRATION ON A 220 MM FULLY CMOS-COMPATIBLE SILICON PHOTONICS PLATFORM	585
<i>B. Szlag ; K. Hassan ; L. Adelmini ; E. Ghegin ; Ph. Rodriguez ; S. Bensalem ; F. Nemouchi ; T. Bria ; M. Brihoum ; P. Brianceau ; E. Vermande ; O. Pesenti ; A. Schembri ; R. Crochemore ; S. Dominguez ; M. C. Roure ; B. Montmayeur ; L. Sanchez ; C. Jany</i>	
24.2 - QUANTUM CONFINEMENT EFFECTS IN GESN/SIGESN HETEROSTRUCTURE LASERS	589
<i>D. Stange ; N. Von Den Driesch ; D. Rainko ; T. Zabel ; B. Marzban ; Z. Ikonic ; P. Zaumseil ; G. Capellini ; S. Manti ; J. Witzenz ; H. Sigg ; D. Grützmacher ; D. Buca</i>	
24.3 - MONOLITHIC INTEGRATION OF O-BAND PHOTONIC TRANSCEIVERS IN A “ZERO-CHANGE” 32NM SOI CMOS	593
<i>S. Moazeni ; A. Atabaki ; D. Cheian ; S. Lin ; R. J. Ram ; V. Stojanovic</i>	
24.4 - TUNNEL-MODULATED GE LED/LASER LIGHT SOURCE AND A SUB-THERMAL VOLTAGE SWITCHING DETECTOR FOR THE MONOLITHIC ON-CHIP OPTICAL TRANSCEIVER	597
<i>R. Koerner ; I. A. Fischer ; R. Soref ; D. Schwarz ; C. J. Clausen ; L. Hänel ; M. Oehme ; J. Schulze</i>	
24.5 - A NOVEL 25 GBPS ELECTRO-OPTIC POCKELS MODULATOR INTEGRATED ON AN ADVANCED SI PHOTONIC PLATFORM	601
<i>F. Eltes ; M. Kroh ; D. Caimi ; C. Mai ; Y. Popoff ; G. Winzer ; D. Petousi ; S. Lischke ; J. E. Ortmann ; L. Czornomaz ; L. Zimmermann ; J. Fompeyrine ; S. Abel</i>	

25.1 - FAST SWITCHING PERFORMANCE BY 20 A / 730 V ALGAN/GAN MIS-HFET USING ALON GATE INSULATOR.....	605
S. Nakazawa ; H. -A. Shih ; N. Tsurumi ; Y. Anda ; T. Hatsuda ; T. Ueda ; M. Nozaki ; T. Yamada ; T. Hosoi ; T. Shimura ; H. Watanabe ; T. Hashizume	
25.2 - AN INTERDIGITATED GAN MIS-HEMT/SBD NORMALLY-OFF POWER SWITCHING DEVICE WITH LOW ON-RESISTANCE AND LOW REVERSE CONDUCTION LOSS	609
Jiacheng Lei ; Jin Wei ; Gaofei Tang ; Qingkai Qian ; Mengyuan Hua ; Zhaofu Zhang ; Zheyang Zheng ; Kevin J. Chen	
25.3 - LARGE SIGNAL LINEARITY ENHANCEMENT OF ALGAN/GAN HIGH ELECTRON MOBILITY TRANSISTORS BY DEVICE-LEVEL VT ENGINEERING FOR TRANSCONDUCTANCE COMPENSATION.....	613
Sameer Joglekar ; Ujwal Radhakrishna ; Daniel Piedra ; Dimitri Antoniadis ; Tomás Palacios	
25.4 - 200V, 4MV/CM LATERAL DIAMOND MOSFET	617
T. T. Pham ; J. Pernot ; C. Masante ; D. Eon ; E. Gheeraert ; G. Chicot ; F. Udrea ; N. Rouger	
25.5 - NOVEL 5V-EDMOS TRANSISTOR WITH A RECORD /MAX OF 450 GHZ IN A BASELINE 40NM CMOS TECHNOLOGY	621
Thanh Viet Dinh ; Jan Sonsky ; Jan Claes ; Oliver Dieball ; Guido T. Sasse ; Celine Detcheverry	
25.6 - HIGH REJECTION UNII 5.2GHZ WIDEBAND BULK ACOUSTIC WAVE FILTERS USING UNDOPED SINGLE CRYSTAL ALN-ON-SIC RESONATORS	625
Michael D. Hodge ; Ramakrishna Vetury ; Shawn R. Gibb ; Mary Winters ; Pinal Patel ; Michael A. McLain ; Ya Shen ; Dae Ho Kim ; Joe Jech ; Ken Fallon ; Rohan Houlden ; David M. Aichele ; Jeffrey B. Shealy	
26.1 - TRANSPARENT ARTIFACT-FREE GRAPHENE ELECTRODES FOR COMPACT CLOSED-LOOP OPTOGENETICS SYSTEMS	629
Xin Liu ; Yichen Lu ; Ege Iseri ; Chi Ren ; Haixin Liu ; Takaki Komiyama ; Duygu Kuzum	
26.2 - HIGH-YIELD PASSIVE SI PHOTODIODE ARRAY TOWARDS OPTICAL NEURAL RECORDING	633
D. Mao ; J. Morley ; Z. Zhang ; M. Donnelly ; G. Xu	
26.3 - INTERACTIONS OF NANOWIRES WITH CELLS AND TISSUE	637
Christelle N. Prinz	
26.4 - INTEGRATION OF FINFETS AND 3D NANOPROBES DEVICES ON A COMMON BIO-PLATFORM FOR MONITORING ELECTRICAL ACTIVITY OF SINGLE NEURONS	641
A. Casanova ; M. -C. Blatche ; F. Mathieu ; L. Bettamin ; H. Martin ; D. Gonzalez-Dunia ; L. Nicu ; G. Larrieu	
26.5 - DIRECT CHARACTERIZATION OF CIRCULATING DNA IN BLOOD PLASMA USING μLAS TECHNOLOGY	645
R. Malbec ; B. Chami ; H. H. T. Ngo ; A. Didelot ; F. Garlan ; S. Garrigou ; V. Taly ; Lorène Aeschbach ; Evgeniya Trofimenko ; Vincent Dion ; A. Boutonnet-Rodat ; F. Ginot ; A. Bancaud	
26.6 - NANOPORES INCORPORATING ITO ELECTRODES FOR ELECTRICAL GATING OF DNA AT DIFFERENT FOLDING STATES	649
Xin Zhu ; Xiaowei Wang ; Zhen Cao ; Zhi Ye ; Chaoming Gu ; Chuan Hong Jin ; Yang Liu	
28.1 - MODELING-BASED DESIGN OF BRAIN-INSPIRED SPIKING NEURAL NETWORKS WITH RRAM LEARNING SYNAPSES	653
G. Pedretti ; S. Bianchi ; V. Milo ; A. Calderoni ; N. Ramaswamy ; D. Ielmini	
28.2 - A 16MB DUAL-MODE RERAM MACRO WITH SUB-14NS COMPUTING-IN-MEMORY AND MEMORY FUNCTIONS ENABLED BY SELF-WRITE TERMINATION SCHEME	657
Wei-Hao Chen ; Wen-Jang Lin ; Li-Ya Lai ; Shuangchen Li ; Chien-Hua Hsu ; Huan-Ting Lin ; Heng-Yuan Lee ; Jian-Wei Su ; Yuan Xie ; Shyh-Shyuan Sheu ; Meng-Fan Chang	
28.3 - COMPRESSED SENSING RECOVERY USING COMPUTATIONAL MEMORY	661
M. Le Gallo ; A. Sebastian ; G. Cherubini ; H. Giefers ; E. Eleftheriou	
28.4 - DATA-AWARE NAND FLASH MEMORY FOR INTELLIGENT COMPUTING WITH DEEP NEURAL NETWORK.....	665
Ken Takeuchi	
28.5 - RECONFIGURABLE NAND/NOR LOGIC GATES IN 28 NM HKMG AND 22 NM FD-SOI FEFET TECHNOLOGY	669
E. T. Breyer ; H. Mulaosmanovic ; T. Mikolajick ; S. Slesazeck	
29.1 - A 10NM HIGH PERFORMANCE AND LOW-POWER CMOS TECHNOLOGY FEATURING 3RD GENERATION FINFET TRANSISTORS, SELF-ALIGNED QUAD PATTERNING, CONTACT OVER ACTIVE GATE AND COBALT LOCAL INTERCONNECTS	673
C. Auth ; A. Aliyarukunju ; M. Asoro ; D. Bergstrom ; V. Bhagwat ; J. Birdsall ; N. Bisnik ; M. Buehler ; V. Chikarmane ; G. Ding ; Q. Fu ; H. Gomez ; W. Han ; D. Hanken ; M. Haran ; M. Hattendorf ; R. Heussner ; H. Hiramatsu ; B. Ho ; S. Jaloviar ; I. Jin ; S. Joshi ; S. Kirby ; S. Kosaraju ; H. Kothari ; G. Leatherman ; K. Lee ; J. Leib ; A. Madhavan ; K. Marla ; H. Meyer ; T. Mule ; C. Parker ; S. Parthasarathy ; C. Pelto ; L. Pipes ; I. Post ; M. Prince ; A. Rahman ; S. Rajamani ; A. Saha ; J. Dacuna Santos ; M. Sharma ; V. Sharma ; J. Shin ; P. Sinha ; P. Smith ; M. Sprinkle ; A. St. Amour ; C. Staus ; R. Suri ; D. Towner ; A. Tripathi ; A. Tura ; C. Ward ; A. Yeoh	

29.2 - PERFORMANCE AND DESIGN CONSIDERATIONS FOR GATE-ALL-AROUND STACKED-NANOWIRES FETS.....	677
S. Barraud ; V. Lapras ; B. Previtali ; M. P. Samson ; J. Lacord ; S. Martinie ; M. -A. Jaud ; S. Athanasiou ; F. Triozon ; O. Rozeau ; J. M. Hartmann ; C. Vizioz ; C. Comboroure ; F. Andrieu ; J. C. Barbé ; M. Vinet ; T. Ernst	
29.3 - ACCURATE PERFORMANCE EVALUATION FOR THE HORIZONTAL NANOSHEET STANDARD-CELL DESIGN SPACE BEYOND 7NM TECHNOLOGY.....	681
Y. M. Lee ; M. H. Na ; A. Chu ; A. Young ; T. Hook ; L. Liebmann ; E. J. Nowak ; S. H. Baek ; R. Sengupta ; H. Trombley ; X. Miao	
29.4 - 22FFL: A HIGH PERFORMANCE AND ULTRA LOW POWER FINFET TECHNOLOGY FOR MOBILE AND RF APPLICATIONS.....	685
B. Sell ; B. Bigwood ; S. Cha ; Z. Chen ; P. Dhage ; P. Fan ; M. Giraud-Carrier ; A. Kar ; E. Karl ; C. -J. Ku ; R. Kumar ; T. Lajoie ; H. -J. Lee ; G. Liu ; S. Liu ; Y. Ma ; S. Mudanai ; L. Nguyen ; L. Paulson ; K. Phoa ; K. Pierce ; A. Roy ; R. Russell ; J. Sandford ; J. Stoeger ; N. Stojanovic ; A. Sultana ; J. Waldemer ; J. Wan ; W. Xu ; D. Young ; J. Zhang ; Y. Zhang ; P. Bai	
29.5 - A 7NM CMOS TECHNOLOGY PLATFORM FOR MOBILE AND HIGH PERFORMANCE COMPUTE APPLICATION	689
S. Narasimha ; B. Jagannathan ; A. Ogino ; D. Jaeger ; B. Greene ; C. Sheraw ; K. Zhao ; B. Haran ; U. Kwon ; A. K. M. Mahalingam ; B. Kannan ; B. Morganfeld ; J. Dechene ; C. Radens ; A. Tessier ; A. Hassan ; H. Narisetty ; I. Ahsan ; M. Aminpur ; C. An ; M. Aquilino ; A. Arya ; R. Augur ; N. Baliga ; R. Bhelkar ; G. Bierry ; A. Blauberg ; N. Borjenscaia ; A. Bryant ; L. Cao ; V. Chauhan ; M. Chen ; L. Cheng ; J. Choo ; C. Christiansen ; T. Chu ; B. Cohen ; R. Coleman ; D. Conklin ; S. Crown ; A. da Silva ; D. Dechene ; G. Derderian ; S. Deshpande ; G. Dillway ; K. Donegan ; M. Eller ; Y. Fan ; Q. Fang ; A. Gassaria ; R. Gauthier ; S. Ghosh ; G. Gifford ; T. Gordon ; M. Gribelyuk ; G. Han ; J. H. Han ; K. Han ; M. Hasan ; J. Higman ; J. Holt ; L. Hu ; L. Huang ; C. Huang ; T. Hung ; Y. Jin ; J. Johnson ; S. Johnson ; V. Joshi ; M. Joshi ; P. Justison ; S. Kalaga ; T. Kim ; W. Kim ; R. Krishnan ; B. Krishnan ; K. Anil ; M. Kumar ; J. Lee ; R. Lee ; J. Lemon ; S. L. Liew ; P. Lindo ; M. Lingalugari ; M. Lipinski ; P. Liu ; J. Liu ; S. Lucarini ; W. Ma ; E. Maciejewski ; S. Madisetti ; A. Malinowski ; J. Mehta ; C. Meng ; S. Mitra ; C. Montgomery ; H. Nayefeh ; T. Nigam ; G. Northrop ; K. Onishi ; C. Ordonio ; M. Ozbek ; R. Pal ; S. Parihar ; O. Patterson ; E. Ramanathan ; I. Ramirez ; R. Ranjan ; J. Sarad ; V. Sardesai ; S. Saudari ; C. Schiller ; B. Senapati ; C. Serrau ; N. Shah ; T. Shen ; H. Sheng ; J. Shepard ; Y. Shi ; M. C. Silvestre ; D. Singh ; Z. Song ; J. Sporre ; P. Srinivasan ; Z. Sun ; A. Sutton ; R. Sweeney ; K. Tabakman ; M. Tan ; X. Wang ; E. Woodard ; G. Xu ; D. Xu ; T. Xuan ; Y. Yan ; J. Yang ; K. B. Yeap ; M. Yu ; A. Zainuddin ; J. Zeng ; K. Zhang ; M. Zhao ; Y. Zhong ; R. Carter ; C. -H. Lin ; S. Grunow ; C. Child ; M. Lagus ; R. Fox ; E. Kaste ; G. Gomba ; S. Samavedam ; P. Agnello ; D. K. Sohn	
30.1 - DEVELOPMENT OF SUSTAINABLE SMART SOCIETY BASED ON TRANSFORMATIVE ELECTRONICS	693
M. Ogura ; Y. Ando ; S. Usami ; K. Nagamatsu ; M. Kushimoto ; M. Deki ; A. Tanaka ; S. Nitta ; Y. Honda ; M. Pristovsek ; H. Kawai ; S. Yagi ; H. Amano	
31.1 - TIME-RESOLVED QUANTUM TRANSPORT FOR OPTOELECTRONICS.....	697
F. Michelini ; K. Beltako ; M. Bescond ; N. Cavassilas ; L. Raymond	
31.2 - COMPUTATIONAL STUDY OF GATE-INDUCED DRAIN LEAKAGE IN 2D-SEMICONDUCTOR FIELD-EFFECT TRANSISTORS	701
Jiahao Kang ; Wei Cao ; Arnab Pal ; Sumeet Pandey ; Steve Kramer ; Richard Hill ; Gurtej Sandhu ; Kaustav Banerjee	
31.3 - HOW TO DERIVE THE HIGHEST MOBILITY FROM 2D FETS — A FIRST-PRINCIPLE STUDY	705
Arnab Pal ; Wei Cao ; Jiahao Kang ; Kaustav Banerjee	
31.4 - A UNIFIED SURFACE POTENTIAL BASED PHYSICAL COMPACT MODEL FOR BOTH UNIPOLAR AND AMBIPOLAR 2D-FET: EXPERIMENTAL VERIFICATION AND CIRCUIT DEMONSTRATION	709
Lingfei Wang ; Yang Li ; Xuewei Feng ; Kah-Wee Ang ; Xiao Gong ; Aaron Thean ; Gengchiau Liang	
31.5 - QUANTITATIVE MODEL FOR SWITCHING ASYMMETRY IN PERPENDICULAR MTJ: A MATERIAL-DEVICE-CIRCUIT CO-DESIGN	713
Deepanjan Datta ; Hemant Dixit ; Samarth Agarwal ; Avirup Dasgupta ; Michael Tran ; Dimitri Houssameddine ; Yogesh Singh Chauhan ; Danny Shum ; Francis Benistant	
32.1 - THE IMPACT OF SEQUENTIAL-3D INTEGRATION ON SEMICONDUCTOR SCALING ROADMAP	717
A. Mallik ; A. Vandooren ; L. Witters ; A. Walke ; J. Franco ; Y. Sherazi ; P. Weckx ; D. Yakimets ; M. Bardon ; B. Parvais ; P. Debacker ; B. W. Ku ; S. K. Lim ; A. Mocuta ; D. Mocuta ; J. Ryckaert ; N. Collaert ; P. Raghavan	
32.2 - HIGH PERFORMANCE LOW TEMPERATURE FINFET WITH DSPER, GATE LAST AND SELF ALIGNED CONTACT FOR 3D SEQUENTIAL INTEGRATION	721
J. Micout ; V. Lapras ; P. Batude ; C. Fenouillet-Beranger ; J. Lacord ; B. Sklenard ; B. Mathieu ; Q. Rafhay ; V. Mazzocchi ; J. -P. Colinge ; L. Lachal ; X. Garros ; M. Casse ; A. Toffoli ; G. Romano ; F. Allain ; L. Brunet ; J. -M. Hartmann ; R. Bortolin ; F. Mazen ; S. Barraud ; N. Rambal ; C. Tabone ; M. -P. Samson ; P. Besombes ; V. Delaye ; Z. Saghi ; V. Loup ; C. Comboroure ; V. Balan ; L. Desvoivres ; C. Vizioz ; G. Ghibaudo ; M. Vinet	

32.3 - MATERIAL INNOVATION FOR MOL, BEOL, AND 3D INTEGRATION	725
<i>J. Koike ; M. Hosseini ; H. T. Hai ; D. Ando , Y. Sutou</i>	
32.4 - SCALABLE, SUB 2µM PITCH, CU/SICN TO CU/SICN HYBRID WAFER-TO-WAFER BONDING TECHNOLOGY	729
<i>Eric Beyne ; Soon-Wook Kim ; Lan Peng ; Nancy Heylen ; Joke De Messemacker ; Oguzhan Orkut Okudur ; Alain Phommahaxay ; Tae-Gon Kim ; Michele Stucchi ; Dimitrios Velenis ; Andy Miller ; Gerald Beyer</i>	
32.5 - HIGH EFFICIENCY DIRECT LIQUID JET IMPINGEMENT COOLING OF HIGH POWER DEVICES USING A 3D-SHAPED POLYMER COOLER	733
<i>T. Tiwei ; H. Oprins ; V. Cherman ; G. Van Der Plas ; I. De Wolf ; E. Beyne ; M. Baelmans</i>	
33.1 - SMART GAN PLATFORM: PERFORMANCE & CHALLENGES	737
<i>Chun-Lin Tsai ; Yun-Hsiang Wang ; M. -H. Kwan ; P. -C. Chen ; F. -W. Yao ; S. -C. Liu ; J. -L. Yu ; C. -L. Yeh ; R. -Y. Su ; W. Wang ; W. -C. Yang ; K. -Y. Wong ; Y. -S. Lin ; M. -C. Lin ; H. -Y. Wu ; C. -M. Chen ; C. -Y. Yu ; C. -B. Wu ; M. -H. Chang ; J. -S. You ; T. -M. Huang ; S. -P. Wang ; L. Y. Tsai ; Chan-Hong Chern ; H. C. Tuan ; Alex Kalnitsky</i>	
33.2 - REVERSE-BIAS STABILITY AND RELIABILITY OF HOLE-BARRIER-FREE E-MODE LPCVD-SINX/GAN MIS-FETS	741
<i>Mengyuan Hua ; Jin Wei ; Qilong Bao ; Jiabei He ; Zhaofu Zhang ; Zheyang Zheng ; Jiacheng Lei ; Kevin J. Chen</i>	
33.3 - IMPROVEMENT OF POSITIVE BIAS TEMPERATURE INSTABILITY CHARACTERISTIC IN GAN MOSFETS BY CONTROL OF IMPURITY DENSITY IN SiO₂ GATE DIELECTRIC	745
<i>T. Yonehara ; Y. Kajiwara ; D. Kato ; K. Uesugi ; T. Shimizu ; Y. Nishida ; H. Ono ; A. Shindome ; A. Mukai ; A. Yoshioka ; M. Kuraguchi</i>	
33.4 - EVIDENCE OF DEFECT BAND IN CARBON-DOPED GAN CONTROLLING LEAKAGE CURRENT AND TRAPPING DYNAMICS	749
<i>C. Koller ; G. Pobegen ; C. Ostermaier ; D. Pogany</i>	
33.5 - TOTAL SUPPRESSION OF DYNAMIC-RON IN ALGAN/GAN-HEMTS THROUGH PROTON IRRADIATION	753
<i>M. Meneghini ; A. Tajalli ; P. Moens ; A. Banerjee ; A. Stockman ; M. Tack ; S. Gerardin ; M. Bagatin ; A. Paccagnella ; E. Zanoni ; G. Meneghesso</i>	
34.1 - ADVANCED SILICON PHOTONICS TECHNOLOGY PLATFORM LEVERAGING A SEMICONDUCTOR SUPPLY CHAIN	757
<i>P. De Dobbelaere ; A. Dahl ; A. Mekis ; B. Chase ; B. Weber ; B. Welch ; D. Foltz ; G. Armijo ; G. Masini ; G. McGee ; G. Wong ; J. Balardeta ; J. Dotson ; J. Schramm ; K. Hon ; K. Khauv ; K. Robertson ; K. Stechschulte ; K. Yokoyama ; L. Planchon ; L. Tullgren ; M. Eker ; M. Mack ; M. Peterson ; N. Rudnick ; P. Milton ; P. Sun ; R. Bruck ; R. Zhou ; S. Denton ; S. Fath-Pour ; S. Gloeckner ; S. Jackson ; S. Pang ; S. Sahni ; S. Wang ; S. Yu ; T. Pinguet ; Y. De Koninck ; Y. Chi ; Y. Liang</i>	
34.2 - RELIABLE 50GB/S SILICON PHOTONICS PLATFORM FOR NEXT-GENERATION DATA CENTER OPTICAL INTERCONNECTS	761
<i>P. Absil ; K. Croes ; A. Lesniewska ; P. De Heyn ; Y. Ban ; B. Snyder ; J. De Coster ; F. Fodor ; V. Simons ; S. Balakrishnan ; G. Lepage ; N. Golshani ; S. Lardenois ; S. A. Srinivasan ; H. Chen ; W. Vanherle ; R. Loo ; R. Boufadil ; M. Detalle ; A. Miller ; P. Verheyen ; M. Pantouvaki ; J. Van Campenhout</i>	
34.3 - DEVELOPMENTS IN 300MM SILICON PHOTONICS USING TRADITIONAL CMOS FABRICATION METHODS AND MATERIALS	765
<i>C. Baudot ; M. Douix ; S. Guerber ; S. Crémer ; N. Vulliet ; J. Planchet ; R. Blanc ; L. Babaud ; C. Alonso-Ramos ; D. Benedikovich ; D. Pérez-Galacho ; S. Messaoudène ; S. Kerdiles ; P. Acosta-Alba ; C. Euvrard-Colnat ; E. Cassan ; D. Marrisi-Morini ; L. Vivien ; F. Boeuf</i>	
34.4 - ADVANCED DEVICES AND PACKAGING OF SI-PHOTONICS-BASED OPTICAL TRANSCEIVER FOR OPTICAL INTERCONNECTION	769
<i>K. Kurata ; K. Yashiki ; J. Fujikata ; T. Horikawa ; K. Kinoshita ; J. Ushida ; M. Tokushima ; Y. Suzuki ; D. Okamoto ; S. Takahashi ; A. Ukita ; K. Takemura ; Y. Ibusuki ; T. Shimizu ; M. Kurihara ; Y. Hagihara ; T. Mogami ; T. Nakamura</i>	
34.5 - FEMTO-JOULE-PER-BIT INTEGRATED NANOPHOTONICS AND CHALLENGE FOR OPTICAL COMPUTATION	773
<i>Masaya Notomi ; Kengo Nozaki ; Akihiko Shinya ; Masato Takiguchi</i>	
35.1 - NEGF BASED TRANSPORT MODELLING WITH A FULL-BAND, PSEUDOPOTENTIAL HAMILTONIAN: THEORY, IMPLEMENTATION AND FULL DEVICE SIMULATIONS	776
<i>Marco G. Pala ; Oves Badami ; David Esseni</i>	
35.2 - FIRST-PRINCIPLES BASED QUANTUM TRANSPORT SIMULATIONS OF NANOSCALE FIELD EFFECT TRANSISTORS	780
<i>Mincheol Shin ; Hyo-Eun Jung ; Sungwoo Jung</i>	
35.3 - DOPANT DIFFUSION IN Si, SIGE AND Ge : TCAD MODEL PARAMETERS DETERMINED WITH DENSITY FUNCTIONAL THEORY	784
<i>Y. Park ; C. Zechner ; Y. Oh ; H. Kim ; I. Martin-Bragado ; E. M. Bazizi ; F. Benistant</i>	

35.4 - FIRST TOPOGRAPHY SIMULATION OF SIC-CHEMICAL-VAPOR-DEPOSITION TRENCH FILLING, DEMONSTRATING THE ESSENTIAL IMPACT OF THE GIBBS-THOMSON EFFECT.....	788
K. Mochizuki ; S. Ji ; R. Kosugi ; Y. Yonezawa ; H. Okumura	
35.5 - A PHYSICS-BASED INVESTIGATION OF PT-SALT DOPED CARBON NANOTUBES FOR LOCAL INTERCONNECTS	792
J. Liang ; R. Ramos ; J. Dijon ; H. Okuno ; D. Kalita ; D. Renaud ; J. Lee ; V. P. Georgiev ; S. Berrada ; T. Sadi ; A. Asenov ; B. Uhlig ; K. Lilienthal ; A. Dhavamani ; F. Könenmann ; B. Gotsmann ; G. Goncalves ; B. Chen ; K. Teo ; R. R. Pandey ; A. Todri-Sanial	
36.1 - MOS/VO₂ VDW HETEROJUNCTION DEVICES: TUNABLE RECTIFIERS, PHOTODIODES AND FIELD EFFECT TRANSISTORS	796
N. Oliva ; E. A. Casu ; C. Yan ; A. Krammer ; A. Magrez ; A. Schueler ; O. J. F. Martin ; A. M. Ionescu	
36.2 - A SINGLE MAGNETIC-TUNNEL-JUNCTION STOCHASTIC COMPUTING UNIT	800
Yang Lv ; Jian-Ping Wang	
36.3 - NEUROMORPHIC COMPUTING THROUGH TIME-MULTIPLEXING WITH A SPIN-TORQUE NANO-OSCILLATOR	804
M. Riou ; F. Abreu Araujo ; J. Torrejon ; S. Tsunegi ; G. Khalsa ; D. Querlioz ; P. Bortolotti ; V. Cros ; K. Yakushiji ; A. Fukushima ; H. Kubota ; S. Yuasa ; M. D. Stiles ; J. Grollier	
36.4 - STDP SYNAPSE WITH OUTSTANDING STABILITY BASED ON A NOVEL INSULATOR-TO-METAL TRANSITION FET.....	808
P. Stolar ; A. Schulman ; A. Kitoh ; A. Sawa ; I. H. Inoue	
36.5 - ALL-ELECTRICAL UNIVERSAL CONTROL OF A DOUBLE QUANTUM DOT QUBIT IN SILICON MOS	812
Patrick Harvey-Collard ; Ryan M. Jock ; N. Tobias Jacobson ; Andrew D. Baczewski ; Andrew M. Mounce ; Matthew J. Curry ; Daniel R. Ward ; John M. Anderson ; Ronald P. Manginell ; Joel R. Wendt ; Martin Rudolph ; Tammy Pluym ; Michael P. Lilly ; Michel Pioro-Ladrière ; Malcolm S. Carroll	
37.1 - SUB-NM EOT FERROELECTRIC HFO₂ ON P⁺GE WITH HIGHLY RELIABLE FIELD CYCLING PROPERTIES	816
X. Tian ; L. Xu ; S. Shibayama ; T. Nishimura ; T. Yajima ; S. Migita ; A. Toriumi	
37.2 - A COMPARATIVE STUDY OF STRAIN AND GE CONTENT IN Si_{1-x}Ge_x CHANNEL USING PLANAR FETS, FINFETS, AND STRAINED RELAXED BUFFER LAYER FINFETS	820
C. H. Lee ; S. Mochizuki ; R. G. Southwick ; J. Li ; X. Miao ; R. Bao ; T. Ando ; R. Galatage ; S. Siddiqui ; C. Labelle ; A. Knorr ; J. H. Stathis ; D. Guo ; V. Narayanan ; B. Haran ; H. Jagannathan	
37.3 - HIGH PERFORMANCE AND RELIABLE STRAINED SIGE PMOS FINFETS ENABLED BY ADVANCED GATE STACK ENGINEERING	824
Pouya Hashemi ; Takashi Ando ; Eduard A. Cartier ; Kam-Leung Lee ; John Bruley ; Choong-Hyun Lee ; Vijay Narayanan	
37.4 - VERTICALLY STACKED GATE-ALL-AROUND SI NANOWIRE TRANSISTORS: KEY PROCESS OPTIMIZATIONS AND RING OSCILLATOR DEMONSTRATION	828
H. Mertens ; R. Ritzenthaler ; V. Pena ; G. Santoro ; K. Kenis ; A. Schulze ; E. D. Litta ; S. A. Chew ; K. Devriendt ; R. Chiarella ; S. Demuyncck ; D. Yakimets ; D. Jang ; A. Spessot ; G. Eneman ; A. Dangol ; P. Lagrain ; H. Bender ; S. Sun ; M. Korolik ; D. Kioussis ; M. Kim ; K-. H. Bu ; S. C. Chen ; M. Cogorno ; J. Devrajan ; J. Machillot ; N. Yoshida ; N. Kim ; K. Barla ; D. Mocuta ; N. Horiguchi	
37.5 - FIRST VERTICALLY STACKED GESN NANOWIRE PGAAFETS WITH I_{ON} = 1850μA/μM (VOV = VDS = -1V) ON SI BY GESN/GE CVD EPITAXIAL GROWTH AND OPTIMUM SELECTIVE ETCHING.....	832
Yu-Shiang Huang ; Fang-Liang Lu ; Ya-Jui Tsou ; Chung-En Tsai ; Chung-Yi Lin ; Chih-Hao Huang ; C. W. Liu	
38.1 - THRESHOLD SWITCHING SELECTOR AND 1S1R INTEGRATION DEVELOPMENT FOR 3D CROSS-POINT STT-MRAM	836
Hongxin Yang ; Xiaojie Hao ; Zihui Wang ; Roger Malmhall ; Huadong Gan ; Kimihiro Satoh ; Jing Zhang ; Dong Ha Jung ; Xiaobin Wang ; Yuchen Zhou ; Bing K. Yen ; Yiming Huai	
38.2 - MRAM: ENABLING A SUSTAINABLE DEVICE FOR PERVASIVE SYSTEM ARCHITECTURES AND APPLICATIONS	840
S. H. Kang ; C. Park	
38.3 - KEY PARAMETERS AFFECTING STT-MRAM SWITCHING EFFICIENCY AND IMPROVED DEVICE PERFORMANCE OF 400° C-COMPATIBLE P-MTJS	844
G. Hu ; M. G. Gottwald ; Q. He ; J. H. Park ; G. Lauer ; J. J. Nowak ; S. L. Brown ; B. Doris ; D. Edelstein ; E. R. Evarts ; P. Hashemi ; B. Khan ; Y. H. Kim ; C. Kothandaraman ; N. Marchack ; E. J. O'Sullivan ; M. Reuter ; R. P. Robertazzi ; J. Z. Sun ; T. Suwannasiri ; P. L. Trouilloud ; Y. Zhu ; D. C. Worledge	
38.4 - PROBING MAGNETIC PROPERTIES OF STT-MRAM DEVICES DOWN TO SUB-20 NM USING SPIN-TORQUE FMR	848
Luc Thomas ; Guenole Jan ; Son Le ; Santiago Serrano-Guisan ; Yuan-Jen Lee ; Huanlong Liu ; Jian Zhu ; Jodi Iwata-Harms ; Ru-Ying Tong ; Sahil Patel ; Vignesh Sundar ; Dongna Shen ; Yi Yang ; Renren He ; Jesmin Haq ; Zhongjian Teng ; Vinh Lam ; Paul Liu ; Yu-Jen Wang ; Tom Zhong ; Po-Kang Wang	

38.5 - NOVEL APPROACH FOR NANO-PATTERNING MAGNETIC TUNNEL JUNCTIONS STACKS AT NARROW PITCH: A ROUTE TOWARDS HIGH DENSITY STT-MRAM APPLICATIONS	852
<i>V. D. Nguyen ; P. Sabon ; J. Chatterjee ; L. Tille ; P. Veloso Coelho ; S. Aufret ; R. Sousa ; L. Prejean ; E. Gautier ; L. Vila ; B. Dieny</i>	
38.6 - SOLVING THE BEOL COMPATIBILITY CHALLENGE OF TOP-PINNED MAGNETIC TUNNEL JUNCTION STACKS	856
<i>J. Swerts ; E. Liu ; S. Couet ; S. Mertens ; S. Rao ; W. Kim ; K. Garello ; L. Souriau ; S. Kundu ; D. Crotti ; F. Yasin ; N. Jossart ; S. Sakhare ; T. Devolder ; S. Van Beek ; B. O'Sullivan ; S. Van Elshocht ; A. Furnemont ; G. S. Kar</i>	
39.1 - NON-FILAMENTARY (VMCO) MEMORY: A TWO-AND THREE-DIMENSIONAL STUDY ON SWITCHING AND FAILURE MODES	860
<i>U. Celano ; C. Gastaldi ; S. Subhechha ; B. Govoreanu ; G. Donadio ; A. Franquet ; T. Ahmad ; C. Detavernier ; O. Richard ; H. Bender ; L. Goux ; G. S. Kar ; P. Van Der Heide ; W. Vandervorst</i>	
39.2 - ULTRA FAST (<1 NS) ELECTRICAL CHARACTERIZATION OF SELF-HEATING EFFECT AND ITS IMPACT ON HOT CARRIER INJECTION IN 14NM FINFETS	864
<i>Yiming Qu ; Xi Lin ; Junkang Li ; Ran Cheng ; Xiao Yu ; Zejie Zheng ; Jiwu Lu ; Bing Chen ; Yi Zhao</i>	
39.3 - AN ULTRA-DENSE IRRADIATION TEST STRUCTURE WITH A NAND/NOR READOUT CHAIN FOR CHARACTERIZING SOFT ERROR RATES OF 14NM COMBINATIONAL LOGIC CIRCUITS	868
<i>Saurabh Kumar ; Minki Cho ; Luke Everson ; Hoonki Kim ; Qianying Tang ; Paul Mazanec ; Pascal Meinerzhagen ; Andres Malavasi ; Dan Lake ; Carlos Tokunaga ; Muhammad Khellah ; James Tschanz ; Shekhar Borkar ; Vivek De ; Chris H. Kim</i>	
39.4 - INVESTIGATION OF STATISTICAL RETENTION OF FILAMENTARY ANALOG RRAM FOR NEUROMOPHIC COMPUTING	872
<i>Meiran Zhao ; Huaqiang Wu ; Bin Gao ; Qingtian Zhang ; Wei Wu ; Shan Wang ; Yue Xi ; Dong Wu ; Ning Deng ; Shimeng Yu ; Hong-Yu Chen ; He Qian</i>	
39.5 - COMBATTING IC COUNTERFEITING USING SECURE CHIP ODOMETERS	876
<i>N. E. C. Akkaya ; B. Erbagci ; K. Mai</i>	
40.1 - HIGH-Q SILICON FIN BULK ACOUSTIC RESONATORS FOR SIGNAL PROCESSING BEYOND THE UHF	880
<i>M. Ramezani ; M. Ghatge ; R. Tabrizian</i>	
40.2 - MONOLITHICALLY 3D-PRINTED PRESSURE SENSORS FOR APPLICATION IN ELECTRONIC SKIN AND HEALTHCARE MONITORING	884
<i>Jinsu Yoon ; Bongsik Choi ; Yongwoo Lee ; Jungmin Han ; Jieun Lee ; Jinhee Park ; Yeamin Kim ; Dong Myong Kim ; Dae Hwan Kim ; Min-Ho Kang ; Sungho Kim ; Sung-Jin Choi</i>	
40.3 - A NOVEL TRIBOELECTRIC NANOGENERATOR WITH HIGH PERFORMANCE AND LONG DURATION TIME OF SINUSOIDAL CURRENT GENERATION	888
<i>Weon-Guk Kim ; Daewon Kim ; Seung-Bae Jeon ; Sang-Jae Park ; Il-Woong Tcho ; Hagyoul Bae ; Hwon Im ; Yang-Kyu Choi</i>	
40.4 - MEMS HETEROGENEOUS PACKAGED BROADBAND ELECTROMAGNETIC INDUCTION VIBRATION SENSOR AND REMOTE TEMPERATURE SENSOR FOR INDUSTRIAL INTELLIGENT MANUFACTURING	892
<i>Yu-Sheng Lai ; Shao-Hui Hsu ; Chun-Chi Chen ; Meiyi Li ; Ju-Mei Lu ; Hsu-Chun Cheng ; Jui-Min Liu ; Yen-Chang Chen ; Yu-Tsung Tuan ; Cheng-San Wu ; Jia-Min Sheih ; Wen-Kuan Yeh</i>	
40.5 - AN INTEGRATED PLASMONIC REFRACTIVE INDEX SENSOR: Al NANOHOLE ARRAYS ON Ge PIN PHOTODIODES	896
<i>L. Augel ; S. Bechler ; R. Körner ; M. Oehme ; J. Schulze ; I. A. Fischer</i>	
40.6 - NANOFUIDICS FOR CELL AND DRUG DELIVERY	900
<i>N. Di Trani ; A. Grattoni ; M. Ferrari</i>	
Author Index	