2015 IEEE 22nd International Symposium on the Physical and Failure Analysis of Integrated Circuits

(IPFA 2015)

Hsinchu, Taiwan
29 June - 2 July 2015

IEEE Catalog Number: CFP15777-POD
ISBN: 978-1-4799-9929-3

TECHNICAL SESSIONS - June 30, 2015 (Tuesday)

OPENING CEREMONY

8:50 am - 9:15 am		**General Chair's Address....N/A** Steve Chung / *National Chiao Tung University, Taiwan*
9:15 am - 9:20 am		**IPFA 2014 Best Papers Award Presentation**

KEYNOTE SPEECH (I)
CHAIRMAN: Horng-Chih Lin, *NCTU*, Taiwan

9:20 am - 10:10 am	Keynote I	**Reliability and Technology Scaling Beyond the 10nm Node....1** Antony S. Oates / *Taiwan Semiconductor Manufacturing Company, Taiwan*

10:10 am to 10:30 am COFFEE BREAK

KEYNOTE SPEECH (II)
CHAIRMAN: Dr. J. M. Chin, *Advanced Micro Devices*, Singapore

10:30 am - 11:20 am	Keynote II	**3D-IC FPGA: KGD, DFT and Build-in FA capabilities....4** Xin Wu / *Xilinx, USA*

EXCHANGED BEST PAPERS
CHAIRMAN: Dr. V. Narang, *Advanced Micro Devices*, Singapore

11:20 am - 12:00 pm	Exchanged Best paper (I)	**<u>ISTFA 2014 Best Paper</u>** **Root Cause Analysis Techniques Using Picosecond Time Resolved LADA....N/A** *Dan J. Bodoh*[1], Kent Erington[1], Kristofor Dickson[1], George Lange[1], Carey Wu,[1] and Tom Crawford[2]/ [1]*New Product and Technology Diagnostic Center, Freescale Semiconductor, Austin, TX,* [2]*DCG Systems, Fremont, CA, USA*
	Exchanged Best Paper (II)	**<u>ESREF 2014 Best Paper</u>** **Study of Thermal Cycling and Temperature Aging on PbSnAg Die Attach Solder Joints for High Power Modules....8** Franc Dugal[1] and Mauro Ciappa[2]/ [1]*ABB, Switzerland;* [2]*ETH Zurich, Switzerland*

12:00 pm to 1:20 pm LUNCH BREAK

SESSION 1: DIE-LEVEL / PACKAGE-LEVEL FAILURE ANALYSIS CASE STUDY & FAILURE MECHANISMS I

CHAIRMAN: Dr. J. M. Chin, *Advanced Micro Devices*, Singapore

1:20 pm - 1:35 pm	1-1	**Laser-Assisted Device Alteration (LADA) for Fault Isolation and Quick Design Fix in Marginality Failure....9** Foo Loke Sheng, Rachel Siew Sok Mun, and Daniel Ting Kung Teck / *Freescale Semiconductor Malaysia Sdn. Bhd., Malaysia*
1:35 pm - 1:50 pm	1-2	**Timing Analysis Case Studies using 1064nm Continuous Wave Laser for Fault Isolation on Scan Failures....13** Gopinath Ranganathan, VenkatKrishnan Ravikumar, Angeline Phoa, and Chea-Wei Teo / *Advanced Micro Devices, Inc., Singapore*
1:50 pm - 2:05 pm	1-3	**Combining Design Simulations with Nano-Probing to Root-Cause a Processor Device Glitch Issue**....17 Chea Wei Teo, Dnyan Khatri, Samuel Wei, Soon Huat Lim, and Vinod Narang / *Advanced Micro Devices, Inc., Singapore*
2:05 pm - 2:20 pm	1-4	**A Technique to Investigate the Root Cause of Write Recovery Time (Twr) Failure....21** Chien-Fu Chen, Hung-Jia Chang, Mei-Ying Hsiao, Sheng-Hsiu Peng, and Yi-Min Lin / *Powerchip Technology Corp., Taiwan*
2:20 pm - 2:45 pm	**Invited** I-1	**From VLSI to WLSI, an Introduction to 3D System Integration....25** Chih Hang Tung / *Taiwan Semiconductor Manufacturing Company, Taiwan*
2:45 pm - 3:00 pm	1-5	**The Demonstrations and Discussion for Static/Read/Write Noise Margin (SNM/RNM/WNM) via Nanoprobing to SRAM FA Applications....26** LiLung Lai[1,3], Nan Li[1], Oscar Zhang[1], and Tim Bao[2] / [1]*Semiconductor Manufacturing International Corp., China;* [2]*DCG system Inc. Richardon, TX, USA;* [3]*Department of Material Science, Fudan university, China*

SESSION 2: ADVANCED INTERCONNECTS AND BEOL RELIABILITY AND FAILURE MECHANISM

CHAIRMAN: Prof. Y.T. Cheng, *NCTU*, Taiwan

1:20 pm - 1:45 pm	**Invited** I-2	**Low-k and High-k Breakdown Statistics with Variability: Clustering Model vs. Reconstruction Methodology....31** Ernest Wu / *IBM, USA*
1:45 pm - 2:00 pm	2-1	**Quality and Reliability Investigation of Ni/Sn Transient Liquid Phase Bonding Technology....35** Tsung-Yen Tsai, Yao-Jen Chang, and Kuan-Neng Chen / *Department of Electronics Engineering, National Chiao Tung University, Taiwan*
2:00 pm - 2:15 pm	2-2	**A Study of Unique Galvanic Failure due to Interaction with Well Structure....39** Wanbing Yi, Boon Fue Phoong, Haifeng Sheng, Daxiang Wang, Teck Leong Wee, Zhehui Wang, Hai Cong, Sung Gon Choi, and Juan Boon Tan / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

2:15 pm - 2:30 pm 2-3 **Characteristic Improvement of Inkjet Printed Ag Interconnects using Tape On-Off and Mirror-Reaction Processes....41**
Zi-Li Guo[1,2], Yu-Min Fu[1] , Yu-Ting Cheng[1] , Bor-Yuan Shew[2], and Pu-Wei Wu[3] / [1]*Microsystems Integration Laboratory, Department of Electronics Engineering, National Chiao Tung University, Taiwan;* [2]*Graduate Degree Program of Science and Technology of Accelerator Light Source, National Chiao Tung University, Taiwan;* [3]*Department of Materials Science and Engineering, National Chiao Tung University, Taiwan*

2:30 pm - 2:45 pm 2-4 **Effect of pre-CMP annealing on TSV Pumping in Thermal Budget and Reliability Test....45**
X. Jing[1,2], U.-H. Lee[3], C. Xu[1], Z. Niu[1], H. Hao[1,2], J.-Y. Bae[3], J. Won[3], and W. Zhang[1] / [1] *National Center for Advanced Packaging, China;* [2]*Institute of Microelectronics, Chinese Academy of Sciences, China;* [3]*Memory Thin Film Technology Team, Samsung Electronics, South Korea*

2:45 pm - 3:00 pm 2-5 **Cu Via Process Optimization by Electromigration Estimation....48**
Yi Heng Chen, Hui-Lan Sung, and Shao-Jui Lo / *Powerchip Technology Corp., Taiwan*

3:00 pm to 3:20 pm COFFEE BREAK

SESSION 3: ADVANCED FAILURE ANALYSIS TECHNIQUES I
CHAIRMAN: Dr. Chih Hang Tung, *TSMC*, Taiwan

3:20 pm -3:45 pm Invited I-3 **Cutting-Edge Technologies for Failure Analysis and Their Applications in Industry....52**
Max Kuo /*Material Analysis Technology Inc., Taiwan.*

3:45 pm - 4:00 pm 3-1 **Application of FIB-SEM and Raman Spectroscopy for Investigating Conductive Carbon Particles in Epoxy Encapsulation of IC....56**
Shih Chia Lai[1], Pradeep Sharma[1], Rik Otte[2], Jung Hao Kung[1], Yao-Han Wang[1], and Sharon Chen[1] / [1]*Regional Quality Centre-Kaohsiung, NXP Semiconductors N.V., Taiwan;* [2]*Regional Quality Centre-Nijmegen, NXP Semiconductors N.V., The Netherlands*

4:00 pm - 4:15 pm 3-2 **Feasibility Study of TOF-SIMS Surface Measurement for Aluminum Bond Pad Fluorine Contamination....61**
Han Wei Teo, Yanjing Yang, Yun Wang, Lei Zhu, Zhi Qiang Mo, Si Ping Zhao, and Jeffrey Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

4:15 pm - 4:30 pm 3-3 **Fast Feature Based Non-Destructive Fault Isolation in 3D IC Packages Utilizing Virtual Known Good Device....64**
Ka Chung Lee[1], Jesse Alton[1], Martin Igarashi[1], and Stephane Barbeau[2] / [1]*TeraView Limited, United Kingdom;* [2]*IBM Microelectronics, Canada*

SESSION 4: DEVICE (GE, III-V, TFT, MEMORY, MEMS, LED ETC.) RELIABILITY AND FAILURE MECHANISMS I

CHAIRMAN: Prof. H. Wong, *City University*, Hong Kong

3:20 pm -3:45 pm	**Invited** I-4	**Effect of Interface Properties of SiC MOS on the Reliability....68** Yuki Mori/ *Hitachi, Japan*
3:45 pm - 4:00 pm	4-1	**Effect of Series Resistance on Dielectric Breakdown Phenomenon of Silicon Carbide MOS Capacitor....72** S. Sato[1], Y. Hiroi[2] , K. Yamabe[2] , M. Kitabatake[3] , T. Endoh[1,4,5], and M. Niwa[1] / [1]*Center for Innovative Integrated Electronic Systems, Tohoku University, Japan;* [2]*Graduate School of Pure and Applied Sciences, University of Tsukuba, Japan;* [3]*R&D Partnership for Future Power Electronics Technology, Japan;* [4]*Center for Spintronics Integrated Systems, Tohoku University, Japan;* [5]*Graduate School of Engineering, Tohoku University, Japan*
4:00 pm - 4:25 pm	**Invited** I-5	**A Unified Model to Understand the Degradation of a-IGZO TFTs under Various Gate Bias Stresses with or without an Illumination....76** Mingxiang Wang / *Department of Microelectronics, Soochow University, China*
4:25 pm - 4:40 pm	4-2	**A Unified Drain Current Model for Poly-Si and a-InGaZnO TFTs under Different Temperatures....80** Zhiyuan Han and Mingxiang Wang / *Department of Microelectronics, Soochow University, China*
4:40 pm - 4:55 pm	4-3	**Stability of High Performance p-type SnO TFTs....84** Chia-Wen Zhong[1], Hsin-You Tsai[1], Horng-Chih Lin[1], Kou-Chen Liu[2], and Tiao-Yuan Huang[1] / [1]*Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan;* [2]*Institute of Electronics Engineering, Chang Gung University, Taiwan*

TECHNICAL SESSIONS - JULY 1, 2015 (WEDNESDAY)

SESSION 5: DIE-LEVEL / PACKAGE-LEVEL FAILURE ANALYSIS CASE STUDY & FAILURE MECHANISMS II

CHAIRMAN: Dr. Frank Huang, *Microsoft*, China

9:15 am - 9:30 am	5-1	**Study on the Impact of Barrier Metal Deposition Processes on W Via/CA ET High Resistance by TEM Failure Analysis....88** Binghai Liu, Tee Irene, Seah Soo Sien, Chen Ye, Elizabeth, Zhu Jie, Eddie Er, Si Ping Zhao, and Jeffery Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*
9:30 am - 9:45 am	5-2	**Cu Wire Bonding Process Induced Fail Mechanism - Inter Layer Dielectric Crack....92** Feng-Min Chang, Nicolas Liu, and Kevin Liu / *Texas Instruments Taiwan Limited, Taiwan*
9:45 am - 10:00 am	5-3	**Comparative Study of Different Technology of Mechanical Decapsulation to Check Excess Solder Issue - Conventional Versus New Approaches....96** Fadhilah Nurani Ramuhzan, Zainal Abas Hasan, and Yusnani Mohamad Yusof / *ON Semiconductor Sdn Bhd., Malaysia*

10:00 am -10:25 am	**Invited** I-6	**Evaluation of Copper Nanoparticles for Low Temperature Bonded Interconnections....102** Chee Lip Gan / *Nanyang Technology University, Singapore*

SESSION 6: NOVEL CMOS GATE STACK/DIELECTRICS AND FEOL RELIABILITY AND FAILURE MECHANISMS I

CHAIRMAN: Prof. Kin Leong Pey, *Singapore University of Technology and Design*, Singapore

9:15 am - 9:30 am	6-1	**On the Origin of Frequency Dependence of Single-Trap Induced Degradation in AC NBTI....107** Dongyuan Mao[1], Shaofeng Guo[1], Runsheng Wang[1], Changze Liu[2], and Ru Huang[1] / [1]*Institute of Microelectronics, Peking University, China;* [2]*System LSI division, Samsung Electronics Co. Ltd., Korea*
9:30 am - 9:45 am	6-2	**UTB GeOI 6T SRAM Cell and Sense Amplifier Considering BTI Reliability....111** Vita Pi-Ho Hu, Pin Su, and Ching-Te Chuang / *Department of Electronics Engineering & Institute of Electronics, National Chiao Tung University, Taiwan*
9:45 am - 10:00 am	6-3	**SRAM V_{MIN} Yield Challenge in 40nm Embedded NVM Process....115** L. Q. Luo[1,2], D. X. Wang[1], F. Zhang[1], J. B. Tan[1], Y. T. Chow[1], Y. J. Kong[1], J. Y. Huang[1], Y. M. Liu[1], M. Oh[1], H. Balan[1], P. Khoo[1], C. Q. Chen[1], B. H. Liu[1], D. Shum[1], K. Shubhakar[2], and K. L. Pey[2] / [1] *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore;* [2]*Singapore University of Technology and Design, Singapore*
10:00 am -10:25 am	**Invited** I-7	**Understanding NBTI-Induced Dynamic Variability in the Nano-Reliability Era: from Devices to Circuits....119** Runsheng Wang /*Peking University, China*

10:25 am to 10:50 am COFFEE BREAK

SESSION 7: SAMPLE PREPARATION, METROLOGY AND MATERIAL CHARACTERIZATION I

CHAIRMAN: Dr. David Su, *TSMC*, Taiwan

10:50 am -11:15 am	**Invited** I-8	**Micro Analysis Regarding Package Interconnection....122** Hideki Hashimoto / *Toray Research Center, Japan*
11:15 am -11:30 am	7-1	**TEM Sample Preparation Methodology and Failure Mechanism Study on Tiny Defect of CT-CT Narrow Space....N/A** Lester Yin, Smith Gao, JH Lee, Mark Zhang, May Yang, and Kary Chien / *Semiconductor Manufacturing International Corporation, China*
11:30 am -11:45 am	7-2	**FIB Tilting Method for Thin TEM Lamella Preparation....126** Liew Kaeng Nan, and Lee Meng Lung / *United Microelectronics Corporation (Singapore Branch), Ltd., Singapore*
11:45 am -12:00 pm	7-3	**Study of Dry Delineation with Argon Sputtering on FIB-milled Copper Profile....130** Poh Chuan Ang, Sharon Lee, Zhiqiang Mo, Yanjing Yang, Siping Zhao, and Jeffrey Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

SESSION 8: ADVANCED FAILURE ANALYSIS TECHNIQUES II
CHAIRMAN: Dr. Z. Qian, *Infineon Technologies AG*, Germany

10:50 am -11:05 am	8-1	**Electrical Model of a PMOS Body Biased Structure in Triple-Well Technology under Pulsed Photoelectric Laser Stimulation....134** N. Borrel[1,2], C. Champeix[1,2,3], E. Kussener[2], W. Rahajandraibe[2], M. Lisart[1], and A. Sarafianos[1] / [1]*STMicroelectronics, Avenue Célestin Coq - ZI de Rousset, France;* [2]*Aix Marseille Université, CNRS, Université de Toulon, France;* [3]*Ecole Nat. Sup. des Mines de St-Etienne, EMSE, LSAS, CMP, France*
11:05 am -11:20 am	8-2	**Debugging MBIST Hard Fails Without Bitmapping....138** Boon Lian Yeoh, Szu Huat Goh, Guo Feng You, Hu Hao, Wei Liang Sio, and Jeffrey Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*
11:20 am -11:35 am	8-3	**High Resistance Open Localization....144** Yen-Hao Jack Chen[1], Po Chih Huang[2], Vladimir Talanov[3], Antonio Orozcoc[3], and Jan Gaudestad[3] / [1]*Honyang, Taiwan;* [2]*TSMC, Taiwan;* [3]*Neocera LLC, USA*
11:35 am -12:00 pm	**Invited** I-9	**Simulation and Experimental Study of High-speed Pulse Tests for Non-DC Fails....N/A** Tim Bao / *DCG System, USA*

12:00 pm to 1:20 pm LUNCH BREAK

SESSION 9(A): NOVEL CMOS GATE STACK/DIELECTRICS AND FEOL RELIABILITY AND FAILURE MECHANISMS II
CHAIRMAN: E. Wu, *IBM,* USA

1:20 pm -1:45 pm	**Invited** I-10	**Understanding Defect Kinetics in Ultra-Thin Dielectric Logic and Memory Devices using Low Frequency Noise Analysis....149** Kin Leong Pey / *Singapore University of Technology and Design, Singapore*
1:45 pm -2:00 pm	9-1	**The RTN Measurement Technique on Leakage Path Finding in Advanced High-k Metal Gate CMOS Devices....154** E. R. Hsieh[1], P. Y. Lu[1], Steve S. Chung[1], J. C. Ke[2], C. W. Yang[2], C. T. Tsai[2], and T. R. Yew[2] / [1]*Department of Electronics Engineering, National Chiao Tung University, Taiwan;* [2]*United Microelectronics Corporation (UMC), Taiwan*
2:00 pm -2:15 pm	9-2	**Localized Random Telegraphic Noise Study in HfO_2 Dielectric Stacks using Scanning Tunneling Microscopy - Analysis of Process and Stress-Induced Traps....158** Alok Ranjan[1,2], K. Shubhakar[1], N. Raghavan[1], R. Thamankar[1], M. Bosman[2], S. J. O'Shea[2], and K. L. Pey[1] / [1]*Singapore University of Technology and Design, Singapore;* [2]*Institute of Materials Research and Engineering, Singapore*

2:15 pm - 2:30 pm 9-3 **Effect of Hf Incorporation in High-κ Sm_2O_3 Dielectric on the Performance of InGaZnO Thin-Film Transistors....**N/A
Rama Krushna Mahanty, Mochamad Januar, Chun-Wen Cheng, Meng-Chyi Wu, and Kou-Chen Liu / *Department of Electronic Engineering, Chang Gung University, Taiwan*

SESSION 9(B): PRODUCT RELIABILITY EVALUATION AND APPROACHES

CHAIRMAN: E. Wu, *IBM,* USA

2:30 pm - 2:45 pm 9-4 **Image Improvement Using Image Processing for Scanning Acoustic Tomograph Images....163**
Kaoru Sakai[1], Osamu Kikuchi[2], Masafumi Takada[2], Natsuki Sugaya[2], and Shigeru Ohno[2] / [1]*Yokohama Research Laboratory Hitachi, Ltd., Japan;* [2]*Hitachi Power Solutions Co., Ltd., Japan*

2:45 pm - 3:00 pm 9-5 **Study and Implementation Conditions of the Multivariate Outlier Detection Methods for Screening of Potential Field Failures....167**
Corinne Bergès[1], Chunlei Wu[2], and Pierre Soufflet[1] / [1]Freescale *Semiconducteurs France SAS, France;* [2]*Freescale Semiconductor (China) Limited, China*

3:00 pm to 3:20 pm COFFEE BREAK

3:20 pm to 5:10 pm POSTER SESSION

P1-1 **Evaporation Method to Eliminate Si-Matrix Interferences for Thick Oxide Wafers VPD-ICPMS Analysis....173**
Hwee Hong Eng, Lei Zhu, Chze Wee Loh, Si Ping Zhao, and Jeffrey Lam / *PTF-FA Department, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P1-2 **SIMS Characterization of Isotope Antimony Implant for Buried Implant....175**
Kian Kok Ong, Yun Wang, Lei Zhu, Zhiqiang Mo, Si Ping Zhao, and Jeffrey Lam / *PTF-FA Department, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P1-3 **Determination of Iodide in Clean Room Air by Ion Chromatography....178**
Jian Ming Zhang, Lei Zhu, S. P. Zhao, B. H. Liu, Edmund Lim, C. K. Ee, D. K. Lau, and Jeffrey Lam / *PTF-FA Department, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P1-4 **Sample Preparation DOE for the Die Pull Test....181**
Xiali Chen, Wei-Ting Kary Chien, Guan Zhang, Yong Zhao, and Bo Cheng / *Semiconductor Manufacturing International (Shanghai) Corporation, China*

P1-5 **Enhanced Passivation Integrity Test for Improved Passivation Failure Detection....185**
Sharon Lee, Poh Chuan Ang, Zhiqiang Mo, Siping Zhao, and Jeffrey Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P1-6 **An Efficient Method of Exposing On-Chip Polyfuses using Dry Chemical Plasma Etching Technique....189**
Raymond Mendaros, and Mary Jane T. Marcelo / *Analog Devices Inc. Gen. Trias, Cavite, Philippines*

P1-7 **Highly Accurate TEM/EDS Analysis to Identify the Thin Stack Oxide-Nitride-Oxide Structure of Advanced NAND Flash Products....193**
Ching-Chun Lin, Sheng-Yu Chen, Jay Wang, and Chia-Lun Hsieh / *Integrated Service Technology, Taiwan*

P1-8 **Quantitative Analysis of the Accuracy of Strain Measurements from Nanobeam Electron Diffraction....197**
Mark J Williamson[1], and John Flanagan[2] / *[1]FEI Company, The Netherlands; [2]FEI Company, Hillsboro, OR*

P2-1 **Junction Well Stain (Delineation) Technique to Unveil Different Types of Implantation Defects....201**
Tze Ping Chua, and Chee Hong Chong / *United Microelectronics Corporation Ltd., Singapore*

P2-2 **The Investigation of Active VC and EBAC Analysis Utilization on Test Structure....205**
Link Chang, Kuo Yu Wang, Simon TC Wong, and Chin-Chun Chang / *United Microelectronics Corporation Ltd., Taiwan*

P2-3 **Debug of Implant Angle Deviation Based on SIMS Analysis....209**
Andy Shi, Nick Li, Sunday Zheng, Peter Li, Mark Zhang, Ming Li, and Kary Chien / *Semiconductor Manufacturing International (Tianjin) Co., Ltd., China*

P2-4 **The Factor Study of Backside Hotspot Localization with Application of Infrared Lock-in Thermography (IR-LIT)....213**
Hoe Tiong Min, and Ng Kiong Kay / *Infineon Technology (M) Sdn. Bhd, Malaysia*

P2-5 **Contaminant Failure Analysis: a Particle Library and its Search Engine....219**
Mei-Ju Lu, Ying-Ta Chiu, and Ping-Feng Yang / *ASE Group Kaohsiung, Taiwan*

P2-6 **SDL(Soft Defect Location) Technical in Analyzing the Laser Beam Wavelength and Temperature Sensitive Failures in VLSI Failure Analysis....223**
Gaojie Wen, Guoqiang Zhang, Li Tian, and Winter Wang / *Product Analysis Engineer of Product Analysis Lab in Freescale Semiconductor (China) Limited, China*

P2-7 **Correlating SEM and SPM for Nanoprobing in Failure Analysis....227**
M. Kemmler, A. Rummel, K. Schock, and S. Kleindiek / *Kleindiek Nanotechnik GmbH, Germany*

P2-8 **Study of De-golding Technology for MIM Capacitor Failure Analysis in GaAS Integrated Circuit....231**
Liyuan Liu, Xuanlong Chen, and Zeya Peng / *The Fifth Research Institute of MIIT, China*

P2-9 **Current Imaging Technique with Nanometer Resolution for Failure Analysis of Metal Layers....234**
Sajal Biring, Chih-Feng Chiang, Chia-Hsiang Yen, and Chih-Hsun Chu / *Materials Analysis Technology Inc., Taiwan*

P2-10 **A New FA Method on 0.13um CIS (CMOS Image Sensor) Technology WAT Poly Rs Open Fail....N/A**
Linghua Pang, Sanan Liang, Ming Li, Mark Zhang, and Kary Chien / *Semiconductor Manufacturing International (Shanghai) Co., Ltd., China*

P2-11 **Application of Atomic Force Probing on the Polysilicon Patterning Issue....238**
P. T. Ng, C. Q. Chen, G. B. Ang, C. T. Quah, H. P. Ng, K. H. Yip, Z. H. Mai, and J. Lam / *GLOBALFOUNDRIES Pte. Ltd., Singapore*

P2-12 **Electrical Simulation on the Localized NVM Failed Cell by AFP Nanoproing....242**
C. Q. Chen, G. B. Ang. P. T. Ng, H. P. Ng, K. H. Yip, Q. Alfred, Z. H. Mai, and Jeffery Lam / *GLOBALFOUNDRIES Pte.Ltd., Singapore*

P2-13 **Improved Fault Localization Method for Power Devices....246**
Huaping Lai, Scott Liao, and Wei Xu / *Shanghai Huahong Grace Semiconductor Manufacturing Corporation, China*

P2-14 **Optimization and Application of Electron Beam Absorbed Current Technique....250**
Qian Li, Lim Soon-Huat, Samuel Wei, Khatri, and Dnyaneshwar / *Advanced Micro Devices (Singapore) Pte Ltd., Singapore*

P3-1 **Vertical SCR Structure for On-Chip ESD Protection in Nanoscale CMOS Technology....255**
Chun-Yu Lin[1], Pin-Hsin Chang[2], Rong-Kun Chang[1], Ming-Dou Ker[2], and Wen-Tai Wang[3] / *[1]Department of Electrical Engineering, National Taiwan Normal University, Taiwan; [2]Institute of Electronics, National Chiao Tung University, Taiwan; [3]Global Unichip Corporation, Taiwan*

P3-2 **Galvanic Corrosion Mechanism and Suppressed Solution on Al/Cu Pads....259**
Chang-Yen Ko[1], Kevin Liu[1], Andy Burnett[2], and Linker Chen[1] / *[1]Texas Instruments Taiwan Limited, Taiwan; [2]Texas Instruments Limited, USA*

P3-3 **A New Localized Ink Coating Methodology for Preventing Photoresist Deformation for TEM Sample Preparation....263**
Sean Seah, Tee Irene, Jili Wang, Laikuan Tam, Kok Wah Lee, Binghai Liu, Eddie Er, Siping Zhao, and Jeffrey Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P3-4 **Leakage Current Study and Relevant Fault Localization by IR-OBIRCH....267**
Chunlei Wu / *Freescale Semiconductor (China) Limited, China*

P3-5 **OBIRCH Analysis of Electrostatic Discharge ICs....271**
Xuanlong Chen[1], Qingsa Li[2], Liyuan Liu[1], and Bing Liu[2] / [1]*China Electronics Product Reliability and Environmental Testing Institute, China;* [2]*Chengdu Sino Microelectronics Technology Co., Ltd., China*

P3-6 **Double Snapback Phenomena in Transient Power-rail ESD Clamp Circuits for Latch-up Free Concerns....275**
Guangyi Lu, Yuan Wang, and Xing Zhang / *Key Laboratory of Microelectronic Devices and Circuits (MoE), Institute of Microelectronics, Peking University, China*

P3-7 **Application of Voltage and Waveform Forcing Method for Electrical Isolation of Complex and Loop Circuit in Failure Analysis....279**
Li Tian, Guoqiang Zhang, Kuibo Lan, Gaojie Wen, and Dong Wang / *Product Analysis Laboratory of Quality Department in Freescale Semiconductor (China) Limited, China*

P3-8 **Study on Salicide Partial Missing Induce Advanced SRAM Device Soft Failure....283**
Shouzhu Guo, Tommy Sun, Pierce Xu, and Ming Jie Xu / *Semiconductor Manufacturing International Corporation (SMIC), China*

P3-9 **2.5D/3D Device Package Level Defect Isolation with the Use of Multiple Curve Tracings and Repeated Thermal Emission Analyses....287**
Lee Lan Yin, Chua Kok Keng, and Grace Tan / *Xilinx Asia Pacific Pte Ltd., Singapore*

P3-10 **Die Front-End Defect Isolation Case Study using Atomic Force Probing and Transmission Electron Microscopy Technology....291**
Chua Kok Keng, Lee Lan Yin, and Grace Tan / *Xilinx Asia Pacific Pte Ltd., Singapore*

P3-11 **Wafer Level Circuit Analysis & Micro-Probing on Open Failure of Voltage Regulator Device....295**
Ang Chung Keow, and Ismail Bin Hashim / *Infineon Technologies (Kulim) Sdn. Bhd, Malaysia*

P3-12 **Study on the Poly Bump Defect by TEM Failure Analysis....299**
Chi Wen Soo[1]*, Binghai Liu*[1]*, Eddie Er*[1]*, Si Ping Zhao*[1]*, Jeffrey Lam*[1]*, Liu Wenhu*[2]*, and Jang Sung Mun*[2] */* [1]*TEM Failure Analysis, Product, Test and Failure Analysis Dept. (PTF Singapore), GLOBALFOUNDRIES Singapore Pte Ltd., Singapore;* [2]*Technology Development, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P3-13 **TEM and Chemical Preferential Etching Analysis of Protected FET Leakage Failure....302**
Lee Nean Sern, Nordin Noor Faizah, and Yong Foo Khong / *Infineon Technologies (Kulim) Sdn Bhd, Malaysia*

P3-14 **In-Depth Analysis to Identify Process Related Defects Causing Electrical Overstress on Clip Bonded Schottky Power Rectifiers: A Case Study....305**
Em Julius De La Cruz, and Yusnani Muhamad Yusof / *ON Semiconductor, Seremban, Malaysia*

P3-15 **Low Voltage In-lens Secondary Electron Imaging in Device Failure Analysis....310**
Mary Grace C. Raborar / *Analog Devices Inc. Gen. Trias, Cavite, Philippines*

P3-16 **Open Via with Capacitive Behaviour Defect in Scan Logic Failure Analysis....314**
Ismail Bin Hashim / *Infineon Technologies (Kulim) Sdn. Bhd, Malaysia*

P3-17 **Reliability Analysis of Amorphous Silicon Thin-Film Transistors during Accelerated ESD stress....318**
Jung-Ruey Tsai[1], Shao-Ming Yang[2], Yi-Jhen Syu[3], Ruey-Dar Chang[3], Gene Sheu[1,2], Chin-Ping Liu[1], Hsiu-Fu Chang[1], Zhao-Hui Wei[1], and Ting-Ting Wen[4] / [1]Department of Photonics and Communication Engineering, Asia University, Taiwan; [2]Department of Computer Science and Information Engineering, Asia University, Taiwan; [3]Department of Electronic Engineering, Chang Gung University, Taiwan; [4]Nano Facility Center, National Chiao Tung University, Taiwan

P3-18 **Static Fault Localization on Memory Failures using Photon Emission Microscopy....322**
N. Dayanand, A.C.T. Quah, C. Q. Chen, G. B. Ang, S. Moon, H. P. Ng, Z. H. Mai, and J. Lam / *Product Failure Analysis group, PTF Department, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P3-19 **A Novel Approach to Deprocess Highly Sensitive Multi-layered IC Device using Polymide Protective Layers Without Damaging Active Circuitry....327**
Nik Mohd Tajuddin Yusof, Wei Yuan Wong, and Fadhilah Nurani Ramuhzan / *ON Semiconductor Sdn Bhd., Malaysia*

P3-20 **Failure Localization on a Low-Dropout Voltage Regulator with Reset Automotive Device due to Wire Bonding Issue....332**
Rowin Valdez Galarce, Lynn Colette Vagues / *ON Semiconductor, Seremban, Malaysia*

P4-1 **A Comparison Study on the Al-based Interfacial Layers for Ge MIS Devices....336**
Yi-Gin Yang, and Bing-Yue Tsui / *Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan*

P4-2 **Impact of Fluorine on Idsat of Field-Effect Transistor....340**
Lei Zhu, Kenny Ong, Zhi Qiang Mo, Si Ping Zhao, and Jeffrey Lam / *PTF FA Department, GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

P4-3 **Influence of Multi-Deposition Multi-Annealing on Time-Dependent Dielectric Breakdown Characteristics of PMOS with High-k/Metal Gate Last Process....N/A**
Yanrong Wang, Hong Yang, Hao Xu, Xiaolei Wang, Weichun Luo, Luwei Qi, Shuxiang Zhang, Wenwu Wang, Jiang Yan, Huilong Zhu, Chao Zhao, Dapeng Chen, and Tianchun Ye / *Key Laboratory of Microelectronics Devices & Integrated Technology, Institute of Microelectronics of Chinese Academy of Sciences, China*

P4-4 **Impact of Different Ultra-thin TiN Thickness (1.4nm and 2.4nm) on Positive Bias Temperature Instability (PBTI) of High-k/Metal Gate nMOSFETs with Gate-Last Process....N/A**
Luwei Qi, Hong Yang, Shangqing Ren, Weichun Luo, Hao Xu, Yanrong Wang, Yefeng Xu, Bo Tang, Wenwu Wang, Jiang Yan, Huilong Zhu, Chao Zhao, Dapeng Chen, and Tianchun Ye / *Key Laboratory of Microelectronics Devices & Integrated Technology, Institute of Microelectronics of Chinese Academy of Sciences, China*

P4-5 **Gate Oxide Reliability Improvement for UMOS Technology....342**
Gang Niu, Wei-Ting Kary Chien, Dennis Zhang, Susie Yu, Daniel Zhao, and Silvia Duan / *Semiconductor Manufacturing International（Tianjin）Co., Ltd., China*

P4-6 **An Investigation on the High Temperature Dependence of the HCI on NMOSFET Transistor....346**
Xiaodong Zhao, Wei-Ting Kary Chien, Dennis Zhang, Susie Yu, Javen Niu, and Silvia Duan / *Semiconductor Manufacturing International（Tianjin）Co., Ltd., China*

P4-7 **Oxygen Pressure Induced the Electrical Properties of Amorphous $LaAlO_3$ Dielectric Deposited by Pulsed Laser Deposition at Room Temperature....350**
Suhendro Purbo Prakoso, and Kou Chen Liu / *Department of Electronic Engineering, Chang Gung University, Taiwan*

P4-8 **An Abnormal Threshold Voltage Variation of the p-type Thin-Film Transistors under DC Bias Stress....354**
Han-Wen Liu[1], Wei-Fong Cao[1], Tsung-Kuei Kang[2], and Fang-Hsing Wang[1] / *[1]Dept. of Electrical Engineering and Institute of Electrical Engineering, and Graduate Institute of Optoelectronic Engineering, National Chung Hsing University, Taiwan; [2]Dept. of Electronic Engineering, Feng-Chia University, Taiwan*

P5-1 **HV PMOSFET V_T Shift Suppression after HTOL by Modified p-Hump Prevention Ion Implant....358**
Kyenam Lee, Hyunho Jang, Jeonghyeon Park, Jintae Kim, Mansik Oh, Ulkyu Seo, and Byungsub Kim / *MagnaChip Semiconductor Ltd., Korea*

P5-2 **Bump Resistance Change Behavior due to Cu-Sn IMCs Formation with Various Solder Diameters....362**
Wan-Lin Hsieh[1], Chau-Jie Zhan[2], Yu-wei Huang[2], and Chih Chen[1] / *[1]Department of Materials Science & Engineering, National Chiao Tung University, Taiwan; [2]Assembly and Reliability Department/EOL/ITRI, Taiwan*

P5-3 **A Study of the Au-Al Bonding Lifetime for MOSFET Devices....366**
Lulu Wang, Lixin Wang, and Bo Gao / *Institute of Microelectronics of Chinese Academy of Sciences, China*

P6-1 **Stability of InGaZnO Thin-Film Transistors with Durimide Passivation....370**
Bo-Shiuan Shie, Chih-Bin Chang, Hao-Chun Chang, Horng-Chih Lin, and Tiao-Yuan Haung / *Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan*

P6-2 **Factors Affecting Hysteresis in the Transfer Curves of a-IGZO TFTs under Illumination and Raised Temperature....374**
Yi-Jung Chen[1] and Ya-Hsiang Tai[2] / *[1]Department of Photonics & Institute of Electro-Optical Engineering, National Chiao Tung University, Taiwan; [2]Department of Photonics & Institute of Display, National Chiao Tung University, Taiwan*

P6-3 **Improved Reliability of GaN HEMTs using Nitrogen Plasma Surface Treatment....378**
Shih-Chien Liu, Gu-Ming Dai, and Edward Yi Chang / *Department of Materials Science and Engineering, National Chiao Tung University, Taiwan*

P6-4 **Performance and Reliability of Non-linear Al-Zn-Sn-O based Resistive Random Access Memory....381**
Yang-Shun Fan[1], Wei-Liang Chan[2], Chih-Hsiang Chang[1], Guang-Ting Zheng[2], Che-Chia Chang[3], and Po-Tsun Liu[4] / *[1]Department of Photonics and Institute of Electro-Optical Engineering, National Chiao Tung University, Taiwan; [2]Department of Electrical Engineering, National Tsing Hua University, Taiwan; [3]Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan; [4]Department of Photonics and Display Institute, National Chiao Tung University, Taiwan*

P6-5 **Simulations of Electric Field Distributions by the Susceptor-Coupling Effects....385**
Fu-Kuo Hsueh[1,2], Chih-Chen Chang[3], Kun-Ping Huang[3], Yao-Jen Lee[1,4], Wen-Fa Wu[1], and Tien-Sheng Chao[2] / *[1]National Nano Device Laboratories, Taiwan; [2]Department of Electrophysics, National Chiao Tung University, Taiwan; [3]Mechanical and Systems Research Lab., Industrial Technology Research Institute, Taiwan; [4]Department of Physics, National Chung Hsing University, Taiwan*

P6-6 **Sequentially Stacked 3DIC Technology using Green Nanosecond Laser Crystallization and Laser Spike Annealing Technologies....389**
Chih-Chao Yang, Tung-Ying Hsieh, Wen-Hsien Huang, Hsing-Hsiang Wang, Chang-Hong Shen, and Jia-Min Shieh / *National Nano Device Laboratories, Taiwan*

P6-7 **Fast and Reliable Charge-trap Non-volatile Memories using Low Thermal Budget Processes in Monolithic 3DIC Application....392**
Wen-Hsien Huang, Chih-Chao Yang, Tung-Ying Hsieh, Hsing-Hsiang Wang, Chang-Hong Shen, and Jia-Min Shieh / *National Nano Device Laboratories, Taiwan*

P6-8 **The Stability of High Voltage AlGaN/GaN HEMTs....N/A**
Ting-Fu Chang and Chih-Fang Huang / *Institute of Electronics Engineering, National Tsing Hua University, Taiwan*

P6-9 **Fault Isolation and TEM Study in the State-of-Art Thin-Film Transistor....395**
Zhou Yongkai, Lee Shik Lin, Fu Chao, Hua Younan, and Li Xiaomin / *WinTech Nano-Technology Services Pte. Ltd., Singapore*

P6-10 **Study on Transparent Amorphous Indium Oxide Thin Film Transistors Technology....399**
Chih-Hsiang Chang[1], Yu-Chia Lai[1], Yang-Shun Fan[1], Guang-Ting Zheng[2], Che-Chia Chang[3], and Po-Tsun Liu[4] / *[1]Department of Photonics and Institute of Electro-Optical Engineering, National Chiao Tung University, Taiwan; [2]Department of Electrical Engineering, National Tsing Hua University, Taiwan; [3]Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan; [4]Department of Photonics and Display Institute, National Chiao Tung University, Taiwan*

P6-11 **Fabrication of a Novel Device by Release the Stress in a Reliable Way....404**
Shuaipeng Wang[1] and Jinling Yang[2] / *[1]NaRi Smartchip Microelectronics Technology Company Limited, China; 2Institute of Semiconductors, Chinese Academy of Sciences, China*

P6-12 **Reduction of Gate-Induced Drain Leakage Current of Polycrystalline Silicon Thin-Film Transistor by Drain Bias Sweeping....407**
Dongli Zhang and Mingxing Wang / *Department of Microelectronics, Soochow University, China*

P6-13 **Reliability Investigation of Flexible Graphene-Based Actuator....411**
Shanbiao Liu[1], Wei Wang[1], Tianyang Yuan[1], Yuanyuan Zhang[2], Ni Zhong[2], Ruijuan Qi[2], Rong Huang[2], Jian Zhang[1], and Xing Wu[1] / *[1]Shanghai Key Laboratory of Multidimensional Information Processing, Department of Electrical Engineering, East China Normal University, China; [2]Key Laboratory of Polar Materials and Devices, MOE, East China Normal University, China*

P6-14 **InGaAs Metal-Oxide-Semiconductor FETs with Self-Aligned Ni-Alloy Source/Drain....415**
Shin-Yuan Wang, Chao-Hsin Chien, Jin-Ju Lin, and Chun-Yen Chang / *Department of Electronics Engineering, Institute of Electronics, National Chiao Tung University, Taiwan*

P6-15 **An Au-free GaN High Electron Mobility Transistor with Ti/Al/W Ohmic Metal Structure....419**
Jing-Neng Yao[1], Yueh-Chin Lin[2], Yu-Lin Chuang[2], Yu-Xiang Huang[3], Wang-Cheng Shih[3], Simon M. Sze[1], and Edward Yi Chang[1,2] / *[1]Department of Electronics Engineering, National Chiao-Tung University, Taiwan; [2]Institute of Materials Science & Engineering, National Chiao-Tung University, Taiwan; [3]Institute of Photonic System, National Chiao-Tung University, Taiwan*

P6-16 **Failure Mechanism of VCSELs in Optical Mouse Applications in Non-hermitic Conditions....423**
Joerg Dreybrodt, and Fabien Malacarne / *EM Microelectronic Marin SA (Swatch Group), Switzerland*

P6-17 **A High Tensile Stress Spacer by Low Temperature Microwave Anneal Induced Electron Channel Mobility Enhancement for Nanoscaled FinFETs Device....426**
Yi-Ju Chen[1], Yao-Ming Huang[1], Yun-Fang Hou[1], Min-Cheng Chen[1], Yao-Jen Lee[1,2], Wen-Fa Wu[1], and Jia-Ming Shieh[1] / [1]*National Nano Device Laboratories, Taiwan;* [2]*Department of Physics, National Chung Hsing University, Taiwan*

P6-18 **Study of Junction Temperature Effect on Electrical Power of Light-Emitting Diode (LED) Devices....430**
Xuehui Tao / *Department of Signal and Control Engineering, Soochow University, China*

P7-1 **Analysis of Electromigration Void Nucleation Failure Time in Open Copper TSVs....434**
Marco Rovitto, Wolfhard H. Zisser, and Hajdin Ceric / *Institute for Microelectronics, TU Wien, Austria*

P7-2 **Fabrication and Reliability Investigation of Copper Pillar and Tapered Through Silicon Via (TSV) for Direct Bonding in 3D Integration....439**
Yu-Wei Chang, and Kuan-Neng Chen / *Department of Electronics Engineering, National Chiao Tung University, Taiwan*

P7-3 **Cu Concentration from Backside Contamination Induced STI Crack after High Temperature Stress....443**
Jim Lee, Zimmermann Gunnar, Hsiang J. Huang, Xu X. Wang, Tim J. Pifer, and Alexander Ambatiello / *Intel Mobile Communications, Intel Innovation Technologies Limited, Taiwan*

P7-4 **Effects of the Initial Stress at the Bottom of Open TSVs....447**
Santo Papaleo, Wolfhard H. Zisser, and Hajdin Ceric / *Institute for Microelectronics, TU Wien, Austria*

P7-5 **Impact of Aspect Ratio and Line Spacing on Microstructure in Damascene Cu Interconnects....451**
Leng Chen / *School of Materials Science and Engineering University of Science and Technology Beijing, China*

6:30 pm to 8:30 pm Banquet

TECHNICAL SESSIONS - July 2, 2015 (Thursday)

SESSION 10: SAMPLE PREPARATION, METROLOGY AND MATERIAL CHARACTERIZATION II
CHAIRMAN: Dr. Eckhard Langer, *GLOBALFOUNDRIES,* Singapore

9:15 am - 9:30 am	10-1	**Comparative Study on Sample Preparation Techniques for Cu-Al Interfacial Analysis....455** Lai-Seng Yeoh[1], Amalia delRosario[1], Chee-Wah Tam[1], Kok-Cheng Chong[1], Susan Li[2], Ercan Adem[2], and Bryan Tracy[2] / *[1]Spansion (Penang) Sdn. Bhd. Phase II, Malaysia; [2]Spansion Inc. 915 DeGuigne Drive, USA.*
9:30 am - 9:45 am	10-2	**A Sample Preparation Methodology to Reduce Sample Edge Unevenness and Improve Efficiency in Delayering the 20-Nm Node IC Chips....459** H. Feng, P. K. Tan, Z. H. Mai, H. H. Yap, G. R. Low, R. He, Y. Z. Zhao, B. Liu, M.K.Dawood, J. Zhu, Y.M. Huang, D.D. Wang, H. Tan, and J. Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*
9:45 am - 10:00 am	10-3	**Decapsulation of 3D Multi-Die Stacked Package....465** Hwee Boon Katherine Kor[1], Qing Liu[1], Yu Wen Siah[1,2], and Chee Lip Gan[1,2] / *[1]Nanyang Technological University, Temasek Laboratories@NTU, Singapore; [2]Nanyang Technological University, School of Materials Science & Engineering, Singapore*
10:00 am - 10:15 am	10-4	**Four-Point Bending Methodology Development for 40nm Technology Cu/Nblk Interface Adhesion Measurement....469** Y. Wang, Y. J. Yang, M. M. Chong, R. R. Nistala, X. S. Rao, C. S. Seet, Z. Q. Mo, S. P. Zhao, and J. Lam / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

SESSION 11: DEVICE (GE, III-V, TFT, MEMORY, MEMS, LED ETC.) RELIABILITY AND FAILURE MECHANISMS II
CHAIRMAN: Prof. Jer-Chyi Wang, *Chang Gung University*, Taiwan

9:15 am - 9:30 am	11-1	**New Insights on the Origin of Resistive Switching in HfO$_2$ Thin Films: The Role of Local Mechanical Strength....472** Yuanyuan Shi[1], Yanfeng Ji[1], Fei Hui[1], Montserrat Nafria[2], Marc Porti[2], Gennadi Bersuker[3], and Mario Lanza[1] / *[1]Institute of Functional Nano & Soft Materials, Soochow University, China; [2]Electronic Engineering Department, Universitat Autonoma de Barcelona, Spain; [3]SEMATECH, USA*
9:30 am - 9:45 am	11-2	**Grain Size Effect of Monolayer MoS$_2$ Transistors Characterized by Second Harmonic Generation Mapping....476** Chih-Pin Lin[1], Li-Syuan Lyu[2], Ching-Ting Lin[1], Pang-Shiuan Liu[1], Wen-Hao Chang[2,4], Lain-Jong Li[3,4], and Tuo-Hung Hou[1,4] / *[1]Department of Electronics Engineering and Institute of Electronics, National Chiao Tung University, Taiwan; [2]Department of Electrophysics, National Chiao Tung University, Taiwan; [3]Physical Sciences and Engineering, King Abdullah University of Science and Technology, Kingdom of Saudi Arabia; [4]Taiwan Consortium of Emergent Crystalline Materials (TCECM), Ministry of Science and Technology, Taiwan*

9:45 am - 10:00 am 11-3 **Temperature Effects on Current-Voltage and Low Frequency Noise Characteristics of Multilayer WSe$_2$ FETs....480**
In-Tak Cho[1], Won-Mook Kang[1], Jeongkyun Roh[1], Changhee Lee[1], Sung Hun Jin[2], and Jong-Ho Lee[1] / [1]*Department of Electrical and Computer Engineering, and ISRC, Seoul National University, South Korea;* [2]*Department of Electronics Engineering, Incheon National University, South Korea*

10:00 am - 10:25 am **Invited** I-11 **Study of Reliability Physics on High-k/Metal Gate and Power devices....484**
Masaaki Niwa / *Tohoku University, Japan*

10:25 am to 10:50 am COFFEE BREAK

SESSION 12: SAMPLE PREPARATION, METROLOGY AND MATERIAL CHARACTERIZATION III

CHAIRMAN: Dr.Tim Bao, *DCG System*, USA

10:50 am - 11:15 am **Invited** I-12 **Micromechanical Robustness of 28nm BEOL Stacks and Design Features....488**
Eckhard Langer / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

11:15 am - 11:30 am 12-1 **Acid Decapsulation for Silver Bonded Wire Package....492**
Satoshi Suzuki / *Nippon Scientific Co., Ltd., Japan*

11:30 am - 11:45 am 12-2 **New Method for Chemical Characterization of Polymer Materials in Industrial Devices : AFM-IR with FIB Sample Preparation....496**
Naoki Baden, Mitsunobu Yasuda, Akiyo Yoshida, and Naoki Muraki / *Toray Research Center, Inc., Japan*

11:45 am - 12:00 pm 12-3 **Diamond Milling with an Atomic Force Microscope....500**
Stephen Ippolito, Sean Zumwalt, and Andy Erickson / *Multiprobe Inc., USA*

SESSION 13: NOVEL CMOS GATE STACK/DIELECTRICS AND FEOL RELIABILITY AND FAILURE MECHANISMS III

CHAIRMAN: Prof. Masaaki Niwa, *Tohoku University*, Japan

10:50 am - 11:15 am **Invited** I-13 **A Study of Fin Shape Effect on the Performance of FinFET....503**
Kai-Lin Lee / *United Microelectronics Corporation, Taiwan*

11:15 am - 11:30 am 13-1 **An Investigation of DC/AC Hot Carrier Degradation in Multiple-fin SOI FinFETs....505**
Hai Jiang[1],Xiaoyan Liu[1], Nuo Xu[2], Yandong He[1], Gang Du[1], and Xing Zhang[1] / [1]*Institute of Microelectronics, Peking University, China;* [2]*University of California, Berkeley, USA*

11:30 am - 11:45 am 13-2 **Characterization and Analysis of Tiny In-line Defect in 28nm Process....509**
Gary Yaobin Zhao, JH Lee, Tom Dai, Mark Zhang, and Kary Chien / *Semiconductor Manufacturing International (Beijing) Corp., China*

11:45 am - 12:00 pm 13-3 **Understanding of HCI Degradation Temperature Dependence in SOI STI-pLDMOSFETs from MR-DCIV Spectroscopy....513**
Yandong He, Ganggang Zhang, and Xing Zhang / *Institute of Microelectronics and Key Laboratory of Microelectronic Devices and Circuits, Peking University, China*

12:00 pm to 1:20 pm LUNCH BREAK

SESSION 14: DIE-LEVEL / PACKAGE-LEVEL FAILURE ANALYSIS CASE STUDY & FAILURE MECHANISMS III

CHAIRMAN: Prof. Chee Lip Gan, *Nanyang Technological University*, Singapore

1:20 pm - 1:45 pm **Invited** I-14 **Novel Interposer Scheme for 3D Integration....517**
Cheng-Ta Ko / *ITRI, Taiwan*

1:45 pm - 2:00 pm 14-1 **Improved CT Reconstruction Resolution using Differential Cone-Beam CT Reconstruction....520**
Syahirah Mohammad Zulkifli[1], B. Zee[2], and T. Liu[3] / [1]*Advanced Micro Devices (Singapore) Pte Ltd., Singapore;* [2]*Singapore Institute of Manufacturing Technology, Singapore*

2:00 pm - 2:15 pm 14-2 **The FA Approaching and Designed Solution to the Hidden PID Killer....524**
Xu Bo Chen, Gang Qian, Li Lung Lai, and Soon Fatt Ng / *Semiconductor Manufacturing International (Shanghai) Corp., China*

2:15 pm - 2:30 pm 14-3 **Improve Latch-up Immunity by Circuit Solution....527**
Hui-Wen Tsai and Ming-Dou Ker / *Institute of Electronics, National Chiao-Tung University, Taiwan*

2:30 pm - 2:45 pm 14-4 **Application Study of Simply and Low Cost Numerical Aperture Increasing Lens (NAIL) System for OBIRCH and EMMI in Backside Failure Analysis....531**
Li Tian, Guoqiang Zhang, Kuibo Lan, Gaojie Wen, and Dong Wang / *Product Analysis Laboratory of Quality Department in Freescale Semiconductor(China) Limited, China*

SESSION 15: DEVICE (GE, III-V, TFT, MEMORY, MEMS, LED ETC.) RELIABILITY AND FAILURE MECHANISMS III

CHAIRMAN: Dr. Wei-Chen Chen, *Macronix*, Taiwan

1:20 pm - 1:45 pm **Invited** I-15 **Reliability Simulation of the TMO RRAM....535**
Xiaoyan Liu / *Peking University, China*

1:45 pm - 2:00 pm 15-1 **Justification and Monte Carlo Simulation of Microstructure Evolution Process of Conductive Filament in Reset Transition in Cu/HfO_2/Pt RRAM....539**
Meiyun Zhang, Shibing Long, Guoming Wang, Xiaoxin Xu, Yang Li, Qi Liu, Hangbing Lv, Haitao Sun, and Ming Liu / *Lab of Nanofabrication and Novel Device Integration, Institute of Microelectronics, Chinese Academy of Sciences, China*

2:00 pm - 2:15 pm 15-2 **Methodology for Stability Evaluation on the Multi-level Storages of Oxide Based Conductive Bridge RAM (CBRAM)....543**
Xiaoxin Xu, Hongtao Liu, Qing Luo, Hangbing Lv, Meiyun

Zhang, Ming Wang, Guoming Wang, Yang Li, Dinglin Xu, Qi Liu, Shibing Long, and Ming Liu / *Lab of Nanofabrication and Novel Device Integration, Institute of Microelectronics, Chinese Academy of Sciences, China*

2:15 pm - 2:30 pm 15-3 **Analysis of Current Compliance on Resistive Switching of Silver Programmable Metallization Cells with Stacked SiO_x/SiO_2 Solid Electrolytes....548**
Jer-Chyi Wang, Chun-Hsiang Chiu, Ya-Ting Chan, and Chao-Sung Lai / *Department of Electronic Engineering, Chang Gung University, Taiwan*

2:30 pm - 2:45 pm 15-4 **Improving the Resistive Switching Reliability via Controlling the Resistance States of RRAM....552**
Yang Li, Meiyun Zhang, Dinglin Xu, Hangbing Lv, Shibing Long, Qi Liu, Guoming Wang, Writam Banerjee, and Ming Liu / *Lab of Nanofabrication and Novel Device Integration, Institute of Microelectronics, Chinese Academy of Sciences, China*

2:45 pm to 3:10 pm COFFEE BREAK

SESSION 16: DIE-LEVEL / PACKAGE-LEVEL FAILURE ANALYSIS CASE STUDY & FAILURE MECHANISMS IV
CHAIRMAN: Dr. Cheng-Ta Ko, *ITRI*, Taiwan

3:10 pm - 3:25 pm 16-1 **Magnetic Current Imaging using Multi Path Analysis for Power Short Localization....556**
Jan Gaudestad[1], Antonio Orozco[1], John Matthews[1], Po Chih Huang[2], and Yen-Hao Jack Chen[3] / [1]*Neocera LLC, USA;* [2]*TSMC, Taiwan;* [3]*Honyang, Taiwan*

3:25 pm - 3:40 pm 16-2 **An Initiative to Develop a New Approach for Fracture Characterization of Silicon Die Crack....560**
Pamela Lin[1], Ming Xue[2], Hai Shu Zhang[2], Chai Chee Meng[2], Huan Xu,[2] and Kun Zhou[1] / [1]*School of Mechanical and Aerospace Engineering, Nanyang Technological University of Singapore, Singapore;* [2]*Infineon Technologies Pte Ltd., Singapore*

3:40 pm - 3:55 pm 16-3 **Copper Dendrite Formation on Laser Fuse Structures of Flip Chip Die....565**
WF Kho and Chan Huan Gim / *Freescale Semiconductor Malaysia Sdn. Bhd., Malaysia*

SESSION 17: ADVANCED FAILURE ANALYSIS TECHNIQUES III
CHAIRMAN: Prof. Yu-Lun Chueh, *NTHU*, Taiwan

3:10 pm - 3:25 pm 17-1 **Active Electrostatic Force Microscopy....569**
Stephen Ippolito, Sean Zumwalt, and Andy Erickson / *Multiprobe Inc., USA*

3:25 pm - 3:40 pm 17-2 **Fault Isolation Using Electrically-enhanced LADA (EeLADA)....572**
Szu Huat Goh, Boon Lian Yeoh, Guo Feng You, Hu Hao, Wei Liang Sio, Jeffrey Lam, and Choon Meng Chua / *GLOBALFOUNDRIES Singapore Pte Ltd., Singapore*

3:40 pm - 3:55 pm 17-3 **The Origin of so-called Ghost Modulated Reflectance Mapping and its Application in FA....577**
Zhongling Qian, Christof Brillert, and Christian Burmer / *Infineon Technologies AG, Munich, Germany*

4:10 pm to 4:40 pm CLOSING REMARKS
CHAIRMAN: Prof. Horng-Chih Lin, *NCTU*, Taiwan