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		University / Japan	:

# TE3: Hi-speed, Wireless, 5G & Beyond 5G

# 16:50-18:30 Thursday, May 12

TE3-1	RF Filter device & Module Packaging Technology	Tetsuya Onishi, Grand Joint Technology /	-
<session invited=""></session>	Trend	Hong Kong	

TE3-2	Electrical Performance Analysis for Bridge Die Package Solution	Po Chih Pan, Fu Cheng Chu, Hung Chun Kuo, Ming Fong Jhong, Chih Yi Huang, Chen Chao	113
		Wang, Advanced Semiconductor Engineering /	! !
		Taiwan	
TE3-3	A Differentially Fed Dual-polarized Antenna-in-	Gengtao Zhang <sup>1</sup> , Haojie Chen <sup>1</sup> , Yang Yang <sup>1</sup> ,	115
	Package Based on Stacked TGV Interposers for 5G	Shenglin Ma <sup>2</sup> , Yufeng Jin <sup>1</sup> , <sup>1</sup> Shenzhen	
	Application	Graduate School of Peking University,	:
	FF	<sup>2</sup> Xiamen University / China	
TE3-4	Low Dk / Df Dielectric Material for 5G Applications	Hirotatsu Ikarashi, Toshiyuki Sato, Shin	117
		Teraki, Masaki Yoshida, Hiroshi Ozaki,	
		NAMICS / Japan	!

#### FA1: Pan Pacific Session

# 11:10-12:25 Friday, May 13

FA1-1 <session invited=""></session>	The Dirty Dozen - 12 Common Mistakes Made When Cleaning Circuit Assemblies	Mike Konrad, Aqueous Technologies / USA	-
FA1-2 <session invited=""></session>	Can Tech Heal All that Ails Healthcare?	Matthew K. Hudes, bdlBilologx / USA	-
FA1-3 <session invited=""></session>	TBD	Chuck Bauer, TechLead / USA	-

## **FA2: IMPACT Session**

## 13:40-15:20 Friday, May 13

FA2-1 <session invited=""></session>	Emerging Technology for Low Temperature Cu Bond	Albert T. Wu, National Central University / Taiwan	-
FA2-2 <session invited=""></session>	Simulation Prediction and Experimental Demonstration of Process-Induced Warpage for RDL- First Fan-Out Panel-Level Packaging	Chang-Chun Lee, National Tsing Hua University / Taiwan	-
FA2-3 <session invited=""></session>	Advanced Materials to Facilitate Hybrid Bonding Technology	Alvin Lee, Brewer Science / Taiwan	-
FA2-4 <session invited=""></session>	Low Temperature Cu-Cu Hybrid Bonding: The Evolution from 400°C to Near Room Temperature	Kuan-Neng Chen, National Yang Ming Chiao Tung University / Taiwan	-

# FA3: Advanced Package Trend & Material

# 15:40-17:20 Friday, May 13

FA3-1 <session invited=""></session>	New Developments in High Performance Packaging	Jan Vardaman, TechSearch International / USA	-
FA3-2	Advanced Low Dk and High-Density Photo-Imageable Dielectrics for RDL Interposer	Tetsuya Nemoto, Junichi Ooto, Hirokazu Ito, Koichi Hasegawa, JSR / Japan	119
FA3-3 <session invited=""></session>	Key Performance of Negative-Tone Photosensitive Insulating Material for Advanced package	Shunsuke Kitajima, Kenta Yamazaki, FUJI FILM / Japan	-
FA3-4 <session invited=""></session>	Development of Photoresist & Temporary Adhesive for Fan-out Packaging	Koki Tamura, TOKYO OHKA KOGYO / Japan	-

## FB1: Advanced Packaging 2

# 11:10-12:50 Friday, May 13

FB1-1	Advanced Under-Bump-Metal Scaling Solder Micro-Bump Interconnect Down to 10µm Pitch	Takahiro Tanaka <sup>1</sup> , Masaru Hatabe <sup>1</sup> , Hironori Yamada <sup>1</sup> , Zhaozhi Li <sup>2</sup> , Yoshihiro Tomita <sup>2</sup> , <sup>1</sup> Ishihara Chemical / Japan, <sup>2</sup> Intel / USA	121
FB1-2	Chemical Bonding Copper and Epoxy Through Self- Assembled Layer	Shuaijie Zhao <sup>1</sup> , Chuantong Chen <sup>1</sup> , Minoru Ueshima <sup>2</sup> , Motoharu Haga <sup>2</sup> , Katsuaki Suganuma <sup>1</sup> , <sup>1</sup> Osaka University, <sup>2</sup> Daicel / Japan	123
FB1-3	Reliability of Sintered Cu Joint on Cu Substrate with or without Ag Metallization	Ming-chun Hsieh <sup>1</sup> , Aiji Suetake <sup>1</sup> , Zheng Zhang <sup>1</sup> , Rieko Okumura <sup>1</sup> , Kei Anai <sup>2</sup> , Katsuaki Suganuma <sup>1</sup> , <sup>1</sup> Osaka University, <sup>2</sup> Mitsui Mining & Smelting / Japan	125

FB1-4	High Thermal Stability Cu-to-Cu Joints Fabricated by Using Ga-based Paste	Tzu-hsuan Huang <sup>1</sup> , Yu-chen Liu <sup>1</sup> , Cheng-en Cheng <sup>2</sup> , Chien-wei Huang <sup>1</sup> , Chih-han Yang <sup>1</sup> , Chih-feng Lin <sup>1</sup> , Cheng-chi Wang <sup>2</sup> , Shih-kang Lin <sup>1</sup> , <sup>1</sup> National Cheng Kung University,	127
		<sup>2</sup> Innolux / Taiwan	

# FB2: Advanced Packaging 3

13:40-15:20 Friday, May 13

FB2-1	Cost and Yield Analysis of Die-to-Wafer Hybrid Bonding	Amy Palesko Lujan, SavanSys Solutions / USA	129
FB2-2	Confined IMCs for low temperature and high throughput D2W bonding	Jaber Derakhshandeh, Douglas Charles La Tulipe, Giovanni Capuz, Vladimir Cherman, Carine Gerets, Tom Cochet, Ehsan Shafahian, Inge De Preter, Geraldine Jamieson, Tomas Webers, Eric Beyne, Gerald Beyer, Andy Miller, imec / Belgium	131
FB2-3	Fundamental Study of IMC Grains at Low Anneal Temperature	Carine Gerets, Jaber Derakhshandeh, Ehsan Shafahian, Tom Cochet, Douglas Charles La Tulipe, Gerald Beyer, Andy Miller, Eric Beyne, imec / Belgium	133
FB2-4	Low Temperature Cu/SiO₂ Hybrid Bonding Fabricated by 2-Step Process	Jia-Juen Ong <sup>1</sup> , Wei-Lan Chiu <sup>2</sup> , Ou-Hsiang Lee <sup>2</sup> , Hsiang-Hung Chang <sup>2</sup> , Chih Chen <sup>1</sup> , <sup>1</sup> National Yang Ming Chiao Tung University, <sup>2</sup> Industrial Technology Research Institute / Taiwan	135

# FB3: Advanced Packaging 4

15:40-17:20 Friday, May 13

		•	
FB3-1	Manufacture of High-Strength Differential Pressure Sensor Using SiCer Technology	C. Kleinholz <sup>1</sup> , A. Cyriax <sup>2</sup> , M. Hintz <sup>2</sup> , J. Muller <sup>1</sup> , T. Ortlepp <sup>2</sup> , <sup>1</sup> Technische Universitat Ilmenau, <sup>2</sup> CiS Forschungsinstitut fur Mikrosensorik / Germany	137
FB3-2	LTCC Patch Antenna Array for 5G Mobile Applications Featuring Embedded Air Cavities	A. Schulz, K. Blau, J. Muller, Technische Universitat Ilmenau / Germany	139
FB3-3	Impact of Backside Defects on Device Characteristics of Ultra-Thin DRAMs with 3-5 µm Si Wafers for Bumpless Build Cube (BBCube) Application	Z. Chen <sup>1,2</sup> , N. Araki <sup>1,3</sup> , Y. Kim <sup>1,2</sup> , T. Fukuda <sup>1</sup> , K. Sakui <sup>1</sup> , T. Nakamura <sup>1</sup> , T. Kobayashi <sup>4</sup> , T. Obara <sup>4</sup> , T. Ohba <sup>1</sup> , <sup>1</sup> Tokyo Institute of Technology, <sup>2</sup> DISCO, <sup>3</sup> DAICEL, <sup>4</sup> Micron Memory Japan / Japan	141
FB3-4	Research on Polynomial Regression Machine Learning Model with K-Means Algorithm for Predicting Advanced Packaging Reliability		143

## FC1: Power Electronics 1

11:10-12:50 Friday, May 13

FC1-1	Effect of Substrate Thinning and Junction-Side Cooling on Thermal Properties of Ga <sub>2</sub> O <sub>3</sub> Diodes	F. Wilhelmi <sup>1,2</sup> , Y. Komatsu <sup>3</sup> , S. Yamaguchi <sup>4</sup> , Y. Uchida <sup>4</sup> , R. Nemoto <sup>4</sup> , A. Lindemann <sup>1</sup> , <sup>1</sup> Magdeburg University, <sup>2</sup> ZF Group / Germany, <sup>3</sup> ZF Japan, <sup>4</sup> Novel Crystal Technology / Japan	145
FC1-2	Reliability of Silicone and Epoxy Resin Encapsulated Power Modules in HV-H3TRB Tests with Thin-Resin Coated Dice	Felix Steiner <sup>1</sup> , Helge Wurst <sup>1</sup> , Benjamin Leyrer <sup>1</sup> , Dai Ishikawa <sup>2</sup> , Hideo Nakako <sup>2</sup> , Thomas Blank <sup>1</sup> , <sup>1</sup> Karlsruhe Institute of Technology / Germany, <sup>2</sup> Showa Denko Materials / Japan	147
FC1-3	Effect of Gate Pad Layout on Thermal Impedance of SiC-MOSFET	F. Kato, S. Sato, H. Hozoji, M. Ikegawa, A. Sakai, K. Watanabe, S. Harada, H. Sato, National Institute of Advanced Industrial Science and Technology / Japan	149

FC1-4	Cu-Sintering on Organic Packages for Power Modules	Hans-Jürgen Albrecht <sup>1</sup> , Dirk Busse <sup>1</sup> ,	151
		Alexander Dahlbüdding <sup>1</sup> , Aaron Hutzler <sup>2</sup> , Olaf	
		Rämer <sup>3</sup> , Ichiro Ota <sup>4</sup> , Hideo Nakako <sup>4</sup> , Florian	
		Pape <sup>4</sup> , Dewi Nilasari <sup>5</sup> , <sup>1</sup> budatec, <sup>2</sup> BondPulse,	
		<sup>3</sup> Fraunhofer Gesellschaft / Germany, <sup>4</sup> Showa	
		Denko Materials / Japan, ⁵Isola Group /	
		Germany	

#### FC2: Power Electronics 2

13:40-15:20 Friday, May 13

FC2-1	Design Optimization of Power Module Structure for Inductance Reduction	Masaki Akimoto, Makoto Yoshida, Tomoyuki Miyashita, Waseda University / Japan	153
FC2-2	Design Consideration of 3D Power SoC Using Virtual Prototyping	Ayano Furue, Sinei Miyasaka, Yusuke Ogushi, Riki Yamanishi, Satoshi Matsumoto, Kyushu Institute of Technology / Japan	155
FC2-3	Multi-Objective Design Optimization of Power Module Performances	Aiki Nakamura, Makoto Yoshida, Tomoyuki Miyashita, Waseda University / Japan	157
FC2-4	Estimation of Switching Transients and Power Losses of SiC-based Power MOSFET Inverter Using Electromagnetic-circuit Co-simulation During Six-step Commutation	Yan-Cheng Liu <sup>1,2</sup> , Hsien-Chie Cheng <sup>1</sup> , Hsin- Han Lin <sup>2</sup> , Shian-Chiau Chiou <sup>2</sup> , Sheng-Tai Wu <sup>2</sup> , Tao-Chih Chang <sup>2</sup> , <sup>1</sup> Feng Chia University, <sup>2</sup> Industrial Technology Research Institute / Taiwan	159

# FC3: Optelectronics

15:40-16:55 Friday, May 13

FC3-1 <session invited=""></session>	90°-Bent Graded-Index Core Polymer Waveguide for High-Bandwidth-Density VCSEL-Based Optical Engine	Naohiro Kohmu <sup>1,2</sup> , Maho Ishii <sup>2</sup> , Ryosuke Hatai <sup>2</sup> , Takaaki Ishigure <sup>2</sup> , <sup>1</sup> Hitachi, <sup>2</sup> Keio University / Japan	-
FC3-2	FPGA-driven High Density Photonic Reservoir Computing	Hidetoshi Numata <sup>1</sup> , Jean Benoit Heroux <sup>2</sup> , Toshiyuki Yamane <sup>1</sup> , Daiju Nakano <sup>1</sup> , <sup>1</sup> IBM Research / Japan, <sup>2</sup> IBM Systems / Canada	161
FC3-3 <session invited=""></session>	Hollow-Core Fiber Connector	Ryo Nagase <sup>1</sup> , Hideki Kamitsuna <sup>2</sup> , Toshiki Maejima <sup>1</sup> , Ryuta Matsuda <sup>1</sup> , <sup>1</sup> Chiba Institute of Technology, <sup>2</sup> YOKOWO / Japan	-

# FD1: Metallic and Inorganic Surface Investigation

11:10-12:50 Friday, May 13

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FD1-1	Electrochemical Analysis of Initial Oxide Layers on Copper Surface	Chi-Hsuan Lin <sup>1</sup> , Wei-Ting Chen <sup>1</sup> , Yu-Cheng Ke <sup>1</sup> , Jenn-Ming Song <sup>1,2</sup> , Kiyokazu Yasuda <sup>2</sup> , <sup>1</sup> National Chung Hsing University / Taiwan, <sup>2</sup> Osaka University / Japan	163
FD1-2	Mechanical and Interfacial Properties Characterization of Physical Vapor Deposited Metallic Films After Rapid Thermal Annealing for Packaging Applications	Kuo-Shen Chen, Tzu-Hui Yang, Yu-Ching Lee, National Cheng-Kung University / Tainan	165
FD1-3	Platinum Interconnections for Harsh Environment Applications Using Atmospheric Pressure Sputtering	J. Bickel <sup>1,3</sup> , M. Schneider-Ramelow <sup>2,3</sup> , KD. Lang <sup>2,3</sup> , R. Gesche <sup>4</sup> , HD. Ngo <sup>1,2</sup> , <sup>1</sup> University of Applied Sciences, <sup>2</sup> Fraunhofer IZM, <sup>3</sup> Technische Universitat Berlin, <sup>4</sup> Beaplas / Germany	167
FD1-4	Post Deposition Treatment of Thin Film HfO <sub>2</sub> Dielectric for Increased Performance in MIM Capacitors	Alaric-Yohei Kawai Pétillot, Shuichi Shoji, Jun Mizuno, Waseda University / Japan	169

#### **FD2: Solder Materials**

13:40-15:20 Friday, May 13

Hashimoto, C. Uyemura / Japan
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FD2-2	Comparison of the Mechanical Properties of Conventional Pb-Free Solders and Eutectic Sn-Bi Solder	Qichao Hao <sup>1</sup> , Xin Fu Tan <sup>1</sup> , Stuart D. McDonald <sup>1</sup> , Keith Sweatman <sup>1,2</sup> , Takatoshi Nishimura <sup>2</sup> , Tetsuro Nishimura <sup>2</sup> , Kazuhiro Nogita <sup>1</sup> , <sup>1</sup> The University of Queensland / Australia, <sup>2</sup> Nihon Superior / Japan	173
FD2-3	Maximum Fluidity Length of Commercial Solder Alloys and the Effects of Ni and Co in Sn-0.7wt%Cu Solder Alloys	Kazuhiro Nogita <sup>1</sup> , Jonathan Read <sup>1</sup> , Stuart D. McDonald <sup>1</sup> , Dong Xu <sup>1</sup> , Tetsuro Nishimura <sup>2</sup> , <sup>1</sup> The University of Queensland / Australia, <sup>2</sup> Nihon Superior / Japan	175
FD2-4	Investigation of the Effects of Surface Finish and Reflow Conditions on the Microstructure and Mechanical Properties of Sn-Based Solders	Flora Somidin <sup>1</sup> , <sup>2</sup> , Tetsuya Akaiwa <sup>3</sup> , Stuart D. McDonald <sup>2</sup> , Tetsuro Nishimura <sup>3</sup> , Xiaozhou Ye <sup>2</sup> , Anthony Smith <sup>2</sup> , Jiye Zhou <sup>2</sup> , Kazuhiro Nogita <sup>2</sup> , <sup>1</sup> The University of Queensland / Australia, <sup>2</sup> Universiti Malaysia Perlis / Malaysia, <sup>3</sup> Nihon Superior / Japan	177

## FD3: Nano-fibers

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FD3-1	The Effect of Humidity on the Morphological Evolution of β-Chitin Prepared by Electrospinning	C. Y. Tsai, C. L. Chung, I-SHOU University / Taiwan	179
FD3-2	Effect of Wetting Agent on Morphology of Cellulose Nano-Fiber Composited Nickel Electroless Plating Film	M. Iioka, W. Kawanabe, I. Shohji, T. Kobayashi, Gunma University / Japan	181
FD3-3	Preparation of Ti/Si-Ti Base Nanofibers by Electrospinning and Heat Treatment	Y. M. Lin, Y. C. Chao, C. L. Chung, I-Shou University / Taiwan	183
FD3-4	The Influence of Lithium Source and Excess Lithium Addition on the Morphology of Electrospun Li <sub>2</sub> SrSiO <sub>4</sub> : Eu <sup>2+</sup> Luminescent Fibers	Wei-Hao Chen, Cho-Liang Chung, Jyung- Dong Lin, Ching-Yun Shih, I-Shou University / Taiwan	N/A

# FE1: Design, Modeling, and Reliability 1

# 11:10-12:50 Friday, May 13

FE1-1	Package Signal Propagation Delay Characterization for DDR5	Shinyoung Park <sup>1</sup> , Vinod Arjun Huddar <sup>2</sup> , <sup>1</sup> Rambus / Korea, <sup>2</sup> Rambus / India	187
FE1-2	PCB Channel Optimization Techniques for High- Speed Differential Interconnects	Li Wern Chew, Cheng Yu Tan, Ming Dak Chai, Yun Rou Lim, Intel Microelectronics (M) / Malaysia	189
FE1-3	Dual Referencing Simulation Approach on High Speed Interconnects USB3.2 (10Gbps)	Li Wern Chew, Paik Wen Ong, Intel Microelectronics (M) / Malaysia	191
FE1-4	Simultaneous Switching Noise Simulation in VDD- Terminated DDR5	Shinyoung Park <sup>1</sup> , Vinod Arjun Huddar <sup>2</sup> , <sup>1</sup> Rambus / Korea, <sup>2</sup> Rambus / India	193

# FE2: Design, Modeling, and Reliability 2

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FE2-1	Evaluation on Process-induced Warpage of Novel Fan-Out Wafer Level Packaging Using TSV Interposer-First Technology	C. F. Yu, Y. W. Huang, T. Y. Ouyang, S. F. Cheng, C. C. Hsiao, Industrial Technology Research Institute / Taiwan	195
FE2-2	Warpage and Stress Simulation Analysis of Substrate on Substrate Antenna in Package (AiP) for 5G CPE Application	Ken Zhang, Vito Lin, David Lai, Yu-Po Wang, Siliconware Precision Industries / Taiwan	197
FE2-3	3D X-Ray Microscope Applied on Fine-Line Inspection of Fan-Out Packages	Cheng-Hsin Liu, Yu-Jen Chang, Yu-Hsiang Hsiao, Yi-Sheng Lin, Advanced Semiconductor Engineering / Taiwan	199
FE2-4	The Shift-Left Die Strength Analysis Method for Memory Die Products	Vance Liu <sup>1</sup> , Yi-Chen Wang <sup>1</sup> , Cyane Tsai <sup>1</sup> , Jeremy Chen <sup>1</sup> , Chong Leong Gan <sup>1</sup> , Raj Bansal <sup>2</sup> , Hem Takiar <sup>2</sup> , <sup>1</sup> Micron Technology / Taiwan, <sup>2</sup> Micron Technology / USA	201

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FE3-2	The Blech Effect Revisited – an in-situ Study	Shih-kang Lin, Yu-chen Liu, Kuan-hsueh Lin, National Cheng Kung University / Taiwan	205
FE3-3	Thermomechanical Analysis on Stress Mitigation of FCPBGA with Low Melting Temperature Solder and Low Elastic Modulus Cu Pillar	Takashi Hisada, Sayuri Kohara, Chinami Marushima, Toyohiro Aoki, IBM Research / Japan	207

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P02	Study on Miniaturization of Planar UWB Monopole Antenna with Electromagnetic Coupling Stub Structure	Chikayo Hata, Nobuyasu Takemura, Nippon Institute of Technology / Japan	211
P03	Development of Wearable Measuring Technology for Deep-Body Temperature	Fukui Shoya, Nobuaki Hashimoto, Suwa University of Science / Japan	213
P04	Formation of Specially Shaped Plating Film by Nickel–Copper Alloy Electrodeposition	T. Kobayashi, A. Kubo, I. Shohji, Gunma University / Japan	215
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P18	A Study of Silicon-based Oxide Fluorescent Nanofibers by Electrospinning	Yu-Ching Chao, Chi-Chieh Li, Cho-Liang Chung, I-SHOU University / Taiwan	243
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P20	Analysis of Micro LED Chip After Laser Transfer	Kensuke Inoue <sup>1</sup> , Ryuichi Sugie <sup>1</sup> , Takahiro Shibamori <sup>1</sup> , Takanori Naijo <sup>1</sup> , Ryo Endoh <sup>1</sup> , Aki Ushiku <sup>1</sup> , Eiji Mori <sup>2</sup> , <sup>1</sup> Toray Research Center, <sup>2</sup> Toray Engineering / Japan	247