

2007 International Microsystems, Packaging, Assembly and Circuits Technology

**Taipei, Taiwan
1-3 October 2007**



IEEE Catalog Number:
ISBN 10:
ISBN 13:

CFP0759B-PRT
1-4244-1636-1
978-1-4244-1636-3

CONTENT

SESSION 1 : Design & Modeling of Advanced Packaging

Characteristics of Copper-to-Silicon Diffusion in Copper Wire Bonding	
S. W. Ricky Lee.....	2
LED Package Design for High Optical Efficiency and Low Viewing Angle	
Nguyen T. Tran and Frank G. Shi.....	10
Fine Pitch “NCF-type Compliant-bumped COG”	
Chao-Chyun An, Shyh-Ming Chang, Ming-Yao Chen, Kuo-Shu Kao, Jimmy Tsang, Sheng-Shu Yang, Chih Chen, Chung-Kuang Lin and Wen-Chih Chen	14
The Measurement Developing of Wafer Level MEMS Microphone	
Hsiao Chieh-Ling, Lu Hui-Chuan, Lee Hsin-Li, Wang Chin-Horng, Chang Pin and Chu Chun-Hsun	18
Impact of Low-K Wire Bond Stacked Flip Chip CSP Package Material on Reliability Test	
Tsung-shu Lin, Chen-hsiao Wang, Joe Lin and K. M. Chen	22
Open Top Mold Package Technology for Wide Range Frequency Optical Sensors	
Tzu-Yin Yen, Wen-Chieh Chuang, Chin-Ching Huang and Min-Te Tu	26
High Efficiency Silicon-Based High Power LED Package Integrated with Micro- Thermoelectric Device	
Chun-Kai Liu, Ming-Ji Dai, Chih-Kuang Yu, Sheng-Liang Kuo and Chung-Yen, Hsu.....	29
Measurement of Mechanical Properties of Optical Diffuser Films by Bugle Test and Finite Element Method	
Wen-Chin Tsai, Lu-Ping Chao, Jiong-shiun Hsu and Jia-Long Jhong.....	34
High Sensitivity Silicon-based Condenser Microphone Design	
Chiung-I Lee, Jian-Ming Chen, Ping-Ting Liou and Shin-Tang Jian.....	38

SESSION 2 : Industrial Session (Dell)

- 1. Dell Perspectives on Halogen-free Electronics – Regulatory/Market Trends, Corporate Targets and Engagement in the HDP User Group and IPC Halogen-Free Projects**
- 2. HDP User Group and the past results of HDP User Group environmental activities (via video conference)**
- 3. ITRI Halogen-free Project Proposal**
- 4. Other company presentations on halogen-free electronics (TBD)**

SESSION 3 : Green Packing & Assembly

Future Lead-Free Alloys- Meeting challenges of Miniaturization	
Ning-Cheng Lee.....	44
Dissolution and Interfacial Reaction between Cu and Sn-Ag-Cu Solders	
C. C. Chang and C. R. Kao.....	54
Solder Joint Strengths and Interfacial Reactions in Various Pbfree Solder Joints	
Ching-Tsung Lin, Chi-Shiung Hsi, Tao-Chih Chang and Ming-Kann Liang.....	58
Tin Whisker Growth Induced by High Electron Current Density	
Y. W. Lin and C. Robert Kao.....	62
The Performance of Various Solder Balls Under High Shear Speed Test	
C. J. Zhan, C. C. Chuang, T. C. Chang and L. C. Shen.....	66

SESSION 4 : Modeling, Testing & Design I

A Study of the Effect on Deformations for ACF Applications	
W. R. Jong, S. H. Peng.....	71
Enhancing Component Level Reliability of Pb-free Flip Chip Package of Cu/Low-K Devices Using FEM-based Sensitivity Analysis	
Kuo-Chin Chang, Chang-Chun Lee, Han-Ping Pu and Mirng-Ji Lii.....	75
CFD-Based Thermal Characterization of Board-Level Microelectronic Devices under Natural Convection Cooling	
Po-Wen Hwang, Hsien-Chie Cheng, Jiunn Fang and Jia-Han Li	79
Structure Deformation of Leadframe in Plastic Encapsulation	
G. S. Shen, Y.J. Lee Yeong-Jyh Lin, Jian-Yu Chen and Sheng-Jye Hwang	83
Thermal Performance of the IC Package Integrated with Micro- Thermoelectric Device	
Chun-Kai Liu, Chih-Kuang Yu, Chung-Yen Hsu, Sheng-Liang Kuo and Ming-Ji Dai	88
Nonlinear Analysis of Large Deflection of Bossed Layered-Plate under Initial Tension	
Chun-Fu Chen and Yu-Chou Wu	93

SESSION 5 : Advanced Packaging Technology I

A Study of Material Effects for the Panel Level Package PLP Technology	
Ming-Chih Yew and Kuo-Ning Chiang.....	98
Role of Minor Zn Addition in the Interfacial Reaction between Lead-Free Solders and Cu	
S. C. Yang, C. E. Ho amd C. R. Kao	102
Warpage Measurement of ACF-bonded COG Package in TFT-LCD after Manufacturing and under Hydrothermal Loads	
M. Y. Tsai, C. Y. Huang, C. W. Ting, Kuo-Shu Kao, Ming-Yao Chen, Jimmy Tsang, Sheng-Shu Yang, Cho-Chyun An and Shyh-Ming Chang	106
Bandwidth Simulation for High Speed Memory Package	
Chen Cheng-Pin	110

SESSION 6 : HDI & Embedded Technology

Novel Approach for a Non-Etching Adhesion Promoter for the Next Generation of IC Substrates	
Patrick Brooks and Shingo Kumashiro	115
New Generation Solution for Micro Via Metallization and Through Hole Plating	
Jim Watowski	119
Studies of Microvia Filling Mechanism and A Novel Cu Plating Formula	
Wei-Ping Dow, Ming-Yao Yen and Shian-Zong Liao	123
Embedded Capacitor Technology in Printed Circuit Board	
Chi-Ying Wu	127
The Development of Chip Embedded for IC Substrate	
Kan-Jung Chia, Shang-Wei Chen, Albert Chang and Shih-Ping Hsu	131

Wafer Level Chip Stacked Module by Embedded IC Packaging Technology

Chien-Wei Chien, Li-Cheng Shen, Tao-Chih Chang, Chin-Yao Chang, Fang-Jun Leu, Tsung-Fu Yang,
Cheng-Ta Ko, Ching-Kuan Lee, Chao-Kai Shu, Yuan-Chang Lee and Ying-Ching Shih 136

SESSION 7 : Advanced Microsystems Technology

CMOS-MEMS Micro Sensors Using Mesoporous Carbon Immobilized by the Dielectrophoresis

Process for Gas Detection

Kuan-Hsun Liao, Chih-Cheng Lu and Chueh-Yang Liu 142

Miniaturized WiFi System Module Using SiP/IPD for Handheld Device Applications

Shih-Ping Liu, Chun-Tai Wang, Chun-Hsien Lee and Wei Wang 146

CMOS compatible directional microphone

Po-Hsun Sung*, Jen-Yi Chen, Kai-hsiang Yen and Chia-yu Wu 149

Study on the Voltage-controlled-oscillator Circuit Implemented with Al/HfO₂/Si Capacitors

Tsai-Sheng Pan, Li-Chun Chang, Chia-Cheng Ho and Bi-Shiou Chiou 153

A Schematic-Based Design Model for Microphone and Circuit Integration

Jen-Yi Chen, Shu-Sheng Lee, Peter Chang, Chun-Hsun Chu, Tamal Mukherjee and Gary K. Fedder..... 157

Modeling of Corrugated Diaphragms for Condenser Microphones

Chang-Hung Chen, Heng-Chuan Kan, Po-Hua Yang and Wang Yeng-Tseng 161

Investigation of Hysteresis Phenomenon of Silicon-based Piezoresistive Pressure Sensor

Hsin-Nan Chiang, Tsung-Lin Chou, Chun-Te Lin and Kou-Ning Chiang 165

Effect of Angular Velocity of Spin Dryer on Wafer Drying Process

Meng-Ju Lin 169

SESSION 8 : Industrial Session (ASE, Taiwan)

On-Chip High-Q Inductor Using Wafer-Level Chip-Scale Package Technology

Hsueh-An Yang 173

Demonstration of Wafer Capping through Glass Frit Bonding and Its Application on Molded

Platform Package

Chien-Yu Chen 177

A Study of Self-Assembled Monolayer Coating for Non-stick Encapsulation Mold

Ya-Yu Hsieh..... 181

Characterizations of ZnO Thin Films Deposited onto Langasite Substrates by r.f. Magnetron Sputtering

Ping-Feng Yang 184

Identification of Mechanical Properties of Cu₆Sn₅, Cu₃Sn, and Ni₃Sn₄ Intermetallic Compounds Using

Nanoindentation

Ping-Feng Yang 189

First-principles Calculations of Elastic Properties of Cu-Sn Crystalline Phases

Jiunn Chen..... 193

Ball Impact Responses of Sn-Ag-Cu Solder Joints Doped with Ni or Ge

Yi-Shao Lai..... 197

Coupled Power and Thermal Cycling Characteristics and Reliability of Stacked-die Packages

Chang-Chi Lee 202

SESSION 9 : Metal Finishing

Is Electroless Ni/Electroless Pd/Immersion Au ENEPIG the Solution of Lead Free Soldering on PCB and IC Packaging Applications?	
YEE, Dennis K. W.	208
Fast Copper Plating Process for TSV Fill	
Stream Chung	219
Characterization of Key Coating Properties of Immersion Tin for PWB	
Stream Chung	223
The Features Comparison for Various Measurements of Organic Solderability Preservatives OSP Thickness and Discussion for Copper Roughness Effect Caused by Various Types Micro-etching Solution.	
Keh-Wen Lin	229
The Use of Modified Oxide Process for Lead-Free Application	
Williams Lin, David Lin and Keven Hsu.....	234

SESSION 10 : Material Process & Equipment

Thermal Management of High Power LEDs: Impact of Die Attach Materials	
J.P. You, Y.Z. He and F.G. Shi.....	239
Impact of Lead Free Solder Materials on Board Level Reliability for Low-K WLCSP	
K. M. Chen, K. K. Ho and D. S. Jiang.....	243
The Study of Thermal Properties and Thermal Resistant Behaviors of Siloxane-modified LED Transparent Encapsulant	
Hsun-Tien Li, Chia-Wen Hsu and Kai-Chi Chen.....	246

SESSION 11 : Advanced Packaging Technology II

Nanopackaging : Nanotechnologies and Electronics Packaging	
James E, Morris.....	251
Simulation and Experimental Studies of Phosphor Concentration and Thickness for Phosphor-Based White Light-Emitting-Diodes	
Nguyen T. Tran, Yuan-Chang Lin and Frank G. Shi	255
A Novel Packaging Process for Open-channel Sensors	
Chung-Yi Hsu, Rex Chen, Jin-Sheng Cheng and Chun-Hsun Chu	258
S-Parameters-Based High Frequency Characterization of Al and Cu Interconnect on Low-k Hydrogen Silsesquioxane-Si Substrate	
Chia-Cheng Ho and Bi-Shiou Chiou.....	262
Thermosonic Flip- Chip Bonding on Copper Pads with Titanium and Silver Layer	
Cheng-Li Chuang, Qing-An Liao, Jong-Ning Aoh Corresponding author, Shi-Jie Liao and Guo-Shing Huang.....	266
Reliability Analysis Using Weibull Distribution on the Breakdown of MIM Capacitors	
Chia-Cheng Ho and Bi-Shiou Chiou.....	270

SESSION 12 : Green PCB & PCBA

Halogen Free Material Being in Your Life

Hsu, Hsuan-Hao275

The Effects of Minor Fe, Co, and Ni Addition to Lead-Free Solders on the Thickness of Cu₃Sn at the Interface

Y. W. Wang and C. R. Kao280

Reliability of High Tg Copper Clad Laminate for Lead-free Assembly

Ado Liu and Jeng-I Chen284

A Thick Photoresist Process for Open-channel Sensing Packaging Applications by JSR THB-151N

Negative UV Photoresist

Chung-Yi Hsu, Rex Chen, Jin-Sheng Chang and Chun-Hsun Chu288

SESSION 13 : Modeling Testing & Design II

Fatigue Life Prediction of Solder Joints under Thermal Cyclic Loading

W. R. Jong, H. C. Tsai and C. T. Huang293

Dynamic Transient Analysis of Wire Bonding for Microstructure of Cu/Low-K Wafer

Pei-Chieh Chin, Chin-Yuan Hu, Shen-Wen Yu, Wei-Yaw Chang and Hsiang-Chen Hsu297

Shape Optimization of Micromachined Biosensing Cantilevers

Kun-Nan Chen and Sun-Po Yu301

Computational Study of a MEMS-Based Catalyzed Micro-Thruster with Homogeneous

Chemical Reaction

Chia-Chin Chen and Heng-Chuan Kan305

High Speed Testing Method on Lead-free Solder

Y. R. Chen, Y. T. Pan, D. S. Liu, C. Y. Kuo and C. L. Hsu309

The Failure Analysis of Lead-Free Solder Joint for Flip Chip CSP on Board

Fu-Ming Tzu, Long-Sun Chao and Jung-Hua Chou314

Theoretical and Experimental Characterization of Process-induced Thermal-mechanical Behaviors of an Ultra-Thin Chip-on-Film Assembly

H.C. Cheng, H.C. Ho and S.T. Lu318

SESSION 14 : Industrial Session (SPIL, Taiwan)

A Study of Board Level Reliability Test with Bump Structure of WLCSP Lead-Free Solder Joints

Frank Kao323

Solder Bump Oxidation Prevention by Fabricating Thermal Oxidation Barrier Layer of Wafer

Level Process

Chine-Kang Hsiung327

Investigation of IMC Growth and Solder Joint Reliability on New Surface Finish-ENEPIG

Chun Hsien Fu331

Molded Underfill Technology for Low-k Flip Chip Packages

Wen Tsung Tseng335

Underfill Selection Strategy for Low-K, High lead/Pb-free Flip Chip Application	
Wen-Hao Lee	338
POP Package (Cavity BGA) Warpage Improvement and Stress Characteristic Analyses	
Chia-Hung Yen	342
Advantage and challenge of coreless Flip-Chip BGA	
Elva Lin	346
Common Mode Signal Pairs Improvement Design in High Speed Application	
Paul Chang	350
Board Level Reliability Study for CSP with 400 um Ball Pitch	
Yeng-Ping Wang	354
SESSION 15 : Green Materials & Assembly	
Digital Inkjet Printing for Chemical Etching	
John Ganjei.....	359
The Development and Application of Low Dk Material	
Peter Liang	363
Photosensitive Polyimide for Coverlay of Flexible Printed Circuit	
Jhy-Long Jeng, Jeng-yu Tsai, Chang-Shing Lu and Jinn-Shing King.....	369
Characterization of Low Loss Materials for High Frequency PCB Application	
Jeng-I Chen, Sanny He and Elren Zhang	373
Lead-Free Process Compatible No Flow Prepreg for Rigid-Flex PCB	
Jian Bin and Jeng-I Chen	377
A Novel Green Technology for the Plated Through Hole Process	
Richard Retallick.....	381
An Interconnect Stress Testing IST Approach on Heavy Copper Printed Circuit Boards under Lead-free Soldering	
Mason Yeh, Demi Jiang and Richard Cheng	385
Organization	390