

# **16th European Microelectronics and Packaging Conference and Exhibition 2007**

**(EMPC 2007)**

**Oulu, Finland  
17-20 June 2007**

**ISBN: 978-1-62276-466-2**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2007) by International Microelectronics and Packaging Society, Europe  
All rights reserved.

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact International Microelectronics and Packaging Society, Nordic  
at the address below.

International Microelectronics and Packaging Society, Nordic  
PO Box 277  
SE-431 24 Molndal, Sweden

[info@imapsnordic.org](mailto:info@imapsnordic.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## **001 - INVITED PAPERS**

<b>Printed Intelligence – Opportunity for Innovations and New Business</b> .....	1
<i>Harri Kopola, Jani-Mikael Kuusisto, Tomi Erho, Jukka Hast, Antti Kemppainen, Terho Kololuoma, Markku Kansakoski, Ari Alastalo, Eero Hurme, Pia Qvintus-Leino, Caj Sodergard, Arto Maaninen</i>	
<b>Advanced Packaging, Friend or Foe</b> .....	3
<i>Ken Ball, Reiner Schuetz, Wolfgang Mackrodt, Georg Meyer-Berg, Klaus Pressel, Alun Jones, Jean Roggen</i>	
<b>Technical Trends on Flat-Panel-Displays (FPDs) in Japan</b> .....	7
<i>Fumio Miyashiro</i>	

## **002 - SIP & EMBEDDED COMPONENTS 1**

<b>Design Tools for System-in-Package Applications</b> .....	13
<i>Anna Fontanelli</i>	
<b>Embedded Passives in Multi-dielectric Layer Printed Wiring Board for IEEE 802.11a/b/g Tri-Mode Dual-band Wireless Card Bus Adapter</b> .....	19
<i>Cheng-Hua Tsai, Chang-Sheng Chen, Chang-Lin Wei, Kuo-Chiang Chin, Wei-Ting Chen, Chin-Sun Shyu</i>	
<b>Embedding of Chips in Flex: A Global Optimization from Thermal, Mechanical and Electrical RF Perspective</b> .....	25
<i>B. Vandevelde, S. Brebels, C. Okoro, H. Oprins, L.C. Chen, W. Christiaens, J. Vanfleteren</i>	
<b>Wafer Level Packaging/Wirefree Die-On-Die Applications to FLASH Memories and Smart Cards</b> .....	31
<i>Christian Val, Pascal Couderc, Christophe Serrano</i>	

## **003 - LTCC 1**

<b>LTCC Materials Selection for the Realization of 10GHz Interdigital Filters</b> .....	35
<i>B. Pierce, P. Barnwell, M. Ehlert, T. Vincent</i>	
<b>Designing SMD Lowpass Filters in Multilayer LTCC Technology</b> .....	40
<i>R. Kulke, G. Mollenbeck, P. Uhlig, K. Maulwurf, M. Rittweger</i>	
<b>High Frequency Characterization of VIAs up to 100 GHz in LTCC and Thick Film Structures</b> .....	45
<i>M. Henry, Benito Sanz Isquierdo, Charles Free, John Batchelor, Paul Young</i>	

## **005 - POSTER 1**

<b>3D Approaches of Optical Waveguide Fabrication on Flexible Substrate and its Application</b> .....	50
<i>Tze Yang Hin, Changqing Liu, Paul P. Conway</i>	
<b>Modeling the Effect of Assembly Parameters on Warpage and Stresses of Molded Package for Inkjet Printing</b> .....	56
<i>Kimmo Kaija, Jani Miettinen, Matti Mantysalo, Pauliina Mansikkamaki, Mikiharu Kuchiki, Mikihiko Tsubouchi, Risto Ronkka</i>	
<b>Printed Antenna Designs</b> .....	62
<i>Roland Reitbauer, Manuela Midl, Wolfgang Stocksreiter</i>	
<b>Inter-plane Coupling Structures for PCB-integrated Multilayer Optical Interconnections</b> .....	68
<i>N. Hendrickx, J. Van Erps, H. Thienpont, P. Van Daele</i>	
<b>Prototyping of Pluggable Out-of-plane Coupling Components for Multilayer Board-level Optical Interconnections</b> .....	73
<i>J. Van Erps, N. Hendrickx, Christof Debaes, P. Van Daele, H. Thienpont</i>	
<b>Opto-mechanical Tolerance Modelling of a Free-space Intra-MCM Optical Interconnect System</b> .....	79
<i>Michael Vervaeke, Christof Debaes, H. Thienpont</i>	
<b>Comparison of Different Silicon Solar Cell Structures</b> .....	85
<i>Ondrej Hegr, Jaroslav Bousek, Ales Poruba, R. Barinka, Jaroslav Sobota</i>	
<b>A Microcontroller-Based Neurostimulator in Thick-film Technology</b> .....	90
<i>Krzysztof Zaraska, Barbara Groger</i>	
<b>Wire Bonding Power Interconnection</b> .....	95
<i>M. Novotny, T. Dvorak, I. Szendiuch</i>	
<b>Thermal Capabilities of Integrated Resistors in Organic Substrates</b> .....	98
<i>Ciprian Ionescu, Norocel Dragos Codreanu, Virgil Golumbeanu, P. Svasta</i>	

<b>Impact of Package Ground Ball and Plated Through Hole (PTH) Count Reduction to Differential Interfaces Signal Integrity</b> .....	103
<i>Jiun Kai Beh</i>	

## **006 - ADVANCED PACKAGING**

<b>UBM Structures for Lead Free Solder Bumping using C4NP</b> .....	107
<i>Klaus Ruhmer, Eric Laine, Karin Hauck, D. Manassis, A. Ostmann, Michael Töpfer</i>	
<b>ECD Wafer Bumping and Packaging for Pixel Detector Applications</b> .....	113
<i>T. Fritzs, Rafael Jordan, O. Ehrmann, H. Reichl</i>	
<b>Interface Reactions during Au-Ball/Wedge and AlSi1-Wedge/Wedge Bonding at Room Temperature</b> .....	119
<i>M. Schneider-Ramelow, K.-D. Lang, U. Geißler, W. Scheel, H. Reichl</i>	
<b>Surface Acoustic Wave Component Packaging</b> .....	125
<i>G. Feiertag, H. Kruger, C. Bauer</i>	

## **007 - OPTOELECTRONICS 1**

<b>Low Cost Hybrid Integration of Laser Diode on Silicon PLC for Optoelectronic Applications</b> .....	130
<i>Luca Maggi, Arturo Canali, Danilo Caccioli, Gianni Preve, Stefano Lorenzotti</i>	
<b>Packaging of Miniaturized Optical Encoder</b> .....	136
<i>Y. Jourlin, O. Parriaux, K. Keranen, J.T. Makinen, M. Karppinen, P. Karioja, M. Johnson</i>	
<b>High Resolution Optical Component Technology for Advanced Novel Encoder (Hi-OCTANE)</b> .....	140
<i>John Carr, Marc P.Y. Desmulliez, Eitan Abraham, Nick Weston, David McKendrick, Matt Kidd, Geoff McFarland, Wyn Meredith, Andrew McKee, Conrad Langton</i>	
<b>Multimode Optical Interconnections Embedded in Flexible Electronics</b> .....	146
<i>E. Bosman, G. Van Steenberge, N. Hendrickx, P. Geerinck, W. Christiaens, J. Vanfleteren, P. Van Daele</i>	

## **008 - NAMIS NETWORK-NANO & MICROSYSTEMS 2**

<b>Integration of Fluidic and Detection Functions in Sensing Systems</b> .....	P IC
<i>C. Khan Malek, S. Ballandras</i>	
<b>Low Temperature Direct Bonding for Wafer-scale Packaging of MEMS</b> .....	P IC
<i>H. Kattelus, T. Suni, K. Henttinen</i>	
<b>Reliability Issues of Optical MEMS Related to Device Packaging</b> .....	P IC
<i>H. Toshiyoshi, K. Isamoto, A. Morosawa, C. Chong, H. Fujita</i>	

## **009 - POSTER 2**

<b>Smart Packaging of Microlenses over a UV-LED Array</b> .....	153
<i>Markus Luetzelschwab, Dominik Weiland, Marc P.Y. Desmulliez</i>	
<b>LTCC Gas Flow detector</b> .....	159
<i>Dominik Jurkow, Leszek J. Golonka, Henryk Roguszczak</i>	
<b>Film Assisted Molding Technologies and Applications for High Volume Mems and Sensor Packages</b> .....	163
<i>Frank Boschman, Ton van Weelden, Arnold Bos</i>	
<b>Transmission Line Pulsing Behavior of Thin Film Resistors</b> .....	165
<i>D. Bonfert, H. Wolf, H. Gieser, G. Klink, P. Svasta</i>	
<b>The Application and Characteristics of the Wire-penetration Films in the Use of Stack-die CSP (Chip Scale Package)</b> .....	171
<i>C.L. Chung, S.L. Fu</i>	
<b>Inertial Bridge with Electronic Compass for Auto Pilots</b> .....	175
<i>P. Svasta, Iaroslav-Andrei Hapenciuc</i>	
<b>High Performance Low-firing Temperature Thick-film Pressure Sensors on Steel</b> .....	179
<i>C. Jacq, T. Maeder, N. Johner, G. Corradini, P. Rysler</i>	
<b>Nonferroelectric Lead-Free Ceramics and Thick Films with High Dielectric Permittivity - Synthesis, Sintering and Properties</b> .....	183
<i>J. Kulawik, D. Szwagierczak</i>	
<b>Development of Micro-Integrated Sensors and Actuators Based on PZT Thick Films</b> .....	189
<i>S. Gebhardt, Thomas Rodig, U. Partsch, Andreas J. Schonecker</i>	
<b>High Volume MEMS Packaging</b> .....	194
<i>Mark Shaw, Federico Ziglioli, Anne Marie Grech, Mario Cortese</i>	
<b>Screen-printed Ruthenium Dioxide pH-electrodes</b> .....	200
<i>Kathrin Reinhardt, Christel Kretzschmar, Claudia Feller</i>	

<b>RF – Membrane Filter Production and Packaging Challenges</b> .....	205
<i>M. Chatras, N. Onda, P. Nigg, Wolfgang Tschanun</i>	
<b>New Type of Micro Sensor with Active Nanoparticle Surface</b> .....	207
<i>Radim Hrdy, Jaromir Hubalek, Katerina Klosova</i>	
<b>Creation of Nanostructured Metal Surface by Template-Based Electrodeposition Method and Its Employment in Sensor Technology</b> .....	211
<i>Katerina Klosova, Jaromir Hubalek</i>	

## **010 - MANUFACTURING TECHNOLOGIES 1**

<b>Capillary Flow Kinetics in the Presence of Uneven Gaps</b> .....	216
<i>Horatio Quinones</i>	
<b>Additional Stresses of ECA Joints due to Moisture Induced Swelling</b> .....	221
<i>Richard C. Low, Ralf Miessner, Jurgen Wilde</i>	
<b>Novel Packaging Technology for Combo Memory Package</b> .....	227
<i>Ville Pekkanen, Matti Mantysalo, Jani Miettinen, Pauliina Mansikkamaki</i>	
<b>Cost Efficient Quality and Production Strategies for Electronics Production</b> .....	233
<i>Martin Oppermann, Wilfried Sauer, Klaus-Jurgen Wolter, Thomas Zerna</i>	

## **011 - OPTOELECTRONICS 2**

<b>Towards Low Cost Coupling Structures for Short-Distance Optical Interconnections</b> .....	239
<i>N. Hendrickx, J. Van Erps, T. Alajoki, N. Destouches, D. Blanc, J. Franc, P. Karioja, H. Thienpont, P. Van Daele</i>	
<b>Surface Mounted Coupling Elements for PCB Embedded Optical Interconnects</b> .....	245
<i>Thomas Kuhner, Marc Schneider</i>	
<b>Optical Coupling and Optoelectronics Integration Studied on Demonstrator for Optical Interconnects on Board</b> .....	250
<i>T. Alajoki, N. Hendrickx, J. Van Erps, Samuel Obi, M. Karppinen, H. Thienpont, P. Van Daele, P. Karioja</i>	
<b>Study of Thermal Behavior in a Multi-Chip-Composed Optoelectronic Package</b> .....	254
<i>J. Tian, S. Sinaga, M. Bartek</i>	

## **012 – GBC**

<b>The Market Situation of Ceramic Micro Circuits</b> .....	260
<i>Erwin Effenberger</i>	
<b>Electronics Manufacturing in Europe – Competing in a Global Market</b> .....	264
<i>Indro Mukerjee</i>	
<b>NXP System-in-Package Vision and Latest 3D Technology Developments</b> .....	265
<i>J.-M. Yannou, F. Neuilly, J.-O. Moreno, M. Pommier, S. Bellenger, P. Biermans</i>	

## **013 – MATERIALS**

<b>Conductive Adhesives for Blue LEDs</b> .....	270
<i>Noritsuka Mizumura, Sen-ichi Ikarashi, Michinori Komagata, Yukio Shirai</i>	
<b>Short and Long Term Reliability of In-mould Sealed Bare and Globtop Shielded Led Devices</b> .....	275
<i>K. Keranen, M. Silvenmoinen, A. Lehto, J. Ollila, T. Salmi, J.T. Makinen, A. Ojapalo, M. Schorpp, P. Hoskio, P. Karioja</i>	
<b>Embedding a Thin Polymer Voltage ESD Suppressing Core in a Chip Package - Alternative to on Chip ESD Protection</b> .....	280
<i>Karen Shrier, Paul Collander</i>	
<b>Tunable Dielectric Material Embedded in LTCC for GHz-Frequency-Range Applications</b> .....	285
<i>S. Rentsch, Tao Hu, J. Muller, R. Stephan, M. Hein, H. Jantunen</i>	

## **014 - SENSORS & MEMS PACKAING**

<b>Vacuum Package design for a MEMS based IR Detector Array</b> .....	289
<i>J. Ollila, M.F. Toy, O. Ferhanoglu, P. Karioja, H. Urey</i>	
<b>Capacitive Micro Force Sensors Manufactured with Mineral Sacrificial Layers</b> .....	293
<i>Y. Fournier, S. Wiedmer, T. Maeder, P. Ryser</i>	
<b>Cavity Formation in a Silicon Cap Wafer Using Aluminum Etch-Stop Layer</b> .....	299
<i>S. Sosin, J. Tian, M. Bartek</i>	

<b>Structural and Electrical Investigation of PZT Films on Different Substrates</b> .....	304
<i>Darko Belavic, Marko Hrovat, Hana Ursic, Silvo Drnovsek, Mitja Jerlah, Jena Cilensek, Janez Holc, Marina Santo Zarnik, Marija Kosec</i>	

## **015 - EUROPEAN PROJECTS ON EMBEDDING ACTIVE AND PASSIVES**

<b>Reliability Aspects of Embedded Chips</b> .....	309
<i>A. Ostmann, D. Manassis, M. Cauwe, Johann-Peter Sommer</i>	
<b>Manufacturing of Demonstrator Printed Circuit Boards with Embedded Active Components</b> .....	315
<i>A. Kriechbaum</i>	
<b>Embedded Actives Technology, from Functional Densification to Fan-out Redistribution</b> .....	320
<i>A. van der Lugt, W. Peels</i>	
<b>Lamination Process Studies for Realisation of Chip Embedding Technologies-Current Applications and Technical Challenges</b> .....	324
<i>D. Manassis, A. Ostmann, S-F. Yen, R. Aschenbrenner, H. Reichl</i>	
<b>High-frequency Modeling and Measurements of Tracks Running on Top of Active Components Embedded in Printed Circuit Boards</b> .....	330
<i>M. Cauwe, J. De Baets</i>	
<b>Cost Modelling for Embedded Component Technology</b> .....	336
<i>J. De Baets, G. Willems, A. Ostmann, A. Kriechbaum, H. Kostner</i>	

## **016 - SIP & EMBEDDED COMPONENTS 2**

<b>Double and Triple Stacked Solder Joint Technology for Further Miniaturization of 3D-SIP</b> .....	340
<i>Serguei Stoukatch, Christophe Winters, Tom Torfs, Walter De Raedt, Eric Beyne, Chris Van Hoof</i>	
<b>Challenges Of 3D/ Stack Die Integration for Thin Large Die</b> .....	346
<i>Gaurav Mehta, Tan H. Hong, Wilson Ong, Y.C. Koh, John D. Beleran, Ravi Kolan</i>	
<b>Through Wafer Interconnect Technologies for 3D System-in-Package</b> .....	352
<i>E. van Grunsven, F. Roozeboom, F. Sanders, F. van den Heuvel, M. Burghoorn, T. Grob</i>	
<b>Thermal Performance of Embedded IC Structure</b> .....	354
<i>Tanja Karila</i>	

## **017 - LTCC 2**

<b>Application of Metallo-organic Pastes on LTCC Substrates</b> .....	359
<i>Jaroslav Kita, Ralf Moos</i>	
<b>Fabrication of High Performance RF-MEMS Structures on Surface Planarised LTCC Substrates</b> .....	364
<i>Massimiliano Dispenza, Roberta Buttiglione, Anna Maria Fiorello, Jarkko Tuominen, K. Kautio, J. Ollila, Pentti Korhonen, Manu Lahdes, Kari Ronka, Simone Catoni, Daniele Pochesci, Romolo Marcelli, Vittorio Foglietti, Elena Cianci, Andrea Coppa</i>	
<b>LTCC Ultra High Isostatic Pressure Sensors</b> .....	370
<i>T. Maeder, B. Afra, Y. Fournier, N. Johner, P. Ryser</i>	
<b>LTCC-Based Sensors for Mechanical Quantities</b> .....	376
<i>U. Partsch, S. Gebhardt, D. Arndt, H. Georgi, H. Neubert, D. Fleischer, M. Gruchow</i>	

## **018 - POSTER 3**

<b>Epoxy-based Polymer for Capacitive Chemical Sensors</b> .....	384
<i>Marijan Macek, Marta Klanjsek Gunde, Nina Hauptman</i>	
<b>Leakage Current, Noise and Reliability of NbO and Ta Capacitors</b> .....	389
<i>V. Sedlakova, J. Sikula, H. Navarova, J. Pavelka, J. Hlavka, Z. Sita</i>	
<b>Analysis Methods for Characterization of Unleaded Solderable Surfaces</b> .....	395
<i>Thomas Hetschel, Klaus-Jurgen Wolter</i>	
<b>Influence of Environmental Conditions on Pb-free Solder Joints Quality</b> .....	401
<i>A. Skwarek, K. Witek</i>	
<b>Forward Compatibility Assessment for Aeronautical and Military Communication Systems (GEAMCOS project)</b> .....	406
<i>O. Maire, A. Chaillot, C. Munier, I. Lombaert-Valot, S. Bousquet, C. Chastanet, D. Plouseau, E. Munier, D. Maron, P. Raynal, S. Villard, R. Dumonteil</i>	
<b>Eco-design Workflow Process</b> .....	412
<i>Cyril Vasko, I. Szendiuch, Karsten Schischke</i>	
<b>Observations on Particle Loaded Silver Inks</b> .....	416
<i>Ulrike Currle, Klaus Krueger</i>	

<b>Preheating in Solderability Testing</b> .....	422
<i>F. Steiner, P. Harant</i>	
<b>Reliability Qualification of Flexible Printed Circuits</b> .....	426
<i>Markus Detert, Thomas Zerna, Klaus-Jurgen Wolter</i>	
<b>Studies of Selected Inspection and Failure Analysis Techniques for LTCC Micromodules</b> .....	432
<i>Kari Remes, Leena Palmu, Petri Ronkainen</i>	
<b>Characterization of Failure Modes and Analysis of Joint Strength Using Various Conditions for High Speed Solder Ball Shear and Cold Ball Pull Tests</b> .....	435
<i>Fubin Song, S.W. Ricky Lee, Stephen Clark, Bob Sykes, Keith Newman</i>	
<b>Comparison of Accelerated Life-time Test Methods of Pb-free Solder Joints</b> .....	441
<i>Zsolt Illyefalvi-Vitez, Pal Nemeth, Oliver Krammer, Janos Pinkola</i>	
<b>On the Simulation of Flexible Circuit Boards</b> .....	447
<i>Luciano Arruda</i>	
<b>Reliability of Flexible Circuits with Different Lead-Free Technologies</b> .....	452
<i>Balint Balogh, Peter Gordon, Zsolt Illyefalvi-Vitez, Graham Farmer, Anna Girulska, Tom Harvey, Gyorgy Kotora, Damien Kirkpatrick</i>	

## **019 - INTERCONNECTION TECHNOLOGIES**

<b>Prospects and Yield of Electrochemical Wafer Plating for Bumping and Signal Routing</b> .....	458
<i>L. Dietrich, M. Töpper, T. Fritzsich, O. Ehrmann, H. Reichl</i>	
<b>Development of Chip to Antenna Interconnections for Contact-less Smart Card Applications</b> .....	467
<i>Jaakko Lenkkeri, Sari Kivela, Eveliina Juntunen, Tuomo Jaakola, Kaj Nummila, Mark Allen, Toni Kaskiala, Gerhard Hillmann, Alan Mathewson</i>	
<b>Reliability of ACA Bonded Flip Chip Joints on LCP and FR-4 Substrates</b> .....	473
<i>Laura Frisk, Anne Cumini</i>	
<b>Second-Level Interconnect – “Package to PCB” – Future Challenges and Solutions</b> .....	479
<i>Ashok N. Kabadi</i>	

## **020 – RF**

<b>Design and Technology Considerations on LTCC Microwave Modules for Fixed Radio Link Equipment</b> .....	490
<i>M. Piloni, A.G. Milani</i>	
<b>LTCC Multilayer Technology Enables Very Compact 20 GHz Switch Unit for Space Applications</b> .....	495
<i>K.-H. Drué, M. Hein, J. Muller, R. Perrone, S. Rentsch, R. Stephan, J. Trabert</i>	
<b>A New Integrated Waveguide Antenna using Multi-Layer Photoimageable Thick-Film Technology</b> .....	500
<i>M. Henry, Benito Sanz Isquierdo, Charles Free, John Batchelor, Paul Young</i>	
<b>Microstrip and Wave-guide SMT Package up to 60 GHz (MWgSP)</b> .....	505
<i>Carlo Buoli, Paolo Bonato, Luigi Negri, Fabio Morgia</i>	

## **021 - POSTER 4**

<b>Influences of the Layout on the Lifetime of Direct Copper Bonding Substrates (DCB)</b> .....	511
<i>Michael Günther, Klaus-Jurgen Wolter</i>	
<b>Solvent Resistance of Silicones when Used in Electronic Chemical Cleaning Environment</b> .....	517
<i>Bill Riegler, Michelle Velderrain, Scott Duffer</i>	
<b>Silicone Polymer Coating for Piezo Actuator Protection</b> .....	523
<i>Marko Pudas, Markus Polet, Jouko Vahakangas</i>	
<b>Selected Perovskite Type LSFO Thin Films for the Infrared Detectors</b> .....	526
<i>Andrzej Lozinski, Pawe- Wierzba</i>	
<b>Immersion Tin Wetting Behaviour with Lead-free Soldering</b> .....	530
<i>Mustafa Oezkoek, Nigel White</i>	
<b>Advanced Thin Film Substrates in Cu-AlN Technology</b> .....	536
<i>E. Feurer, B. Holl, J. Vanselow, K. Ruess, A. Kaiser</i>	
<b>Laser Soldering of LTCC Hermetic Packages with Minimal Thermal Impact</b> .....	540
<i>F. Seigneur, Y. Fournier, T. Maeder, J. Jacot</i>	
<b>The Deposition of Thick Film Paste by Direct Writing</b> .....	545
<i>J. Hladik, J. Vanek, I. Szendiuch</i>	
<b>Direct Write Technique Used for Solar Cell Fabrication</b> .....	548
<i>J. Hladik, R. Barinka, I. Szendiuch</i>	

<b>Study of the Impact of High-voltage Trimming on Several Characteristics of Model TFRs and Their Stability</b> .....	551
<i>N. Johner, T. Maeder, C. Jacq, P. Ryser</i>	
<b>Analysis of Fine-pitch BGA Placement Accuracy</b> .....	556
<i>Johannes Hurtig, Timo Liukkonen</i>	
<b>Fine Line Technology And Panel Plating - Opposing Directions, One Solution</b> .....	560
<i>Stephen Kenny, Bert Reents</i>	
<b>Electro-ultrasonic Spectroscopy of Polymer Based and Cermet Thick Film Resistors</b> .....	564
<i>V. Sedlakova</i>	

## **022 - MANUFACTURING TECHNOLOGIES 2**

<b>Experimental Study of Solder Joint Reliability on Injection Moulded Substrates</b> .....	570
<i>Minna Arra, Ilkka Harkonen, Esko J. Paakkonen</i>	
<b>ASPACT® Additive Circuit Transfer Technology</b> .....	576
<i>Juha Hagberg, Teija Kekonen, Terho Kutilainen</i>	
<b>Advanced Electronics Packaging via M<sup>3</sup>D Direct Writing</b> .....	580
<i>Martin Hedges, Bruce King, Mike Renn</i>	
<b>NanoCT: Visualizing of internal 3D-Structures with Submicrometer Resolution</b> .....	585
<i>Andre Egbert</i>	

## **023 - LAMINATES & QUALITY ISSUE**

<b>Performance and Reliability of Flexible Substrates when subjected to Lead-Free Processing</b> .....	589
<i>M.J. Rizvi, C.Y. Yin, C. Bailey, H. Lu</i>	
<b>Multilayer Flexible Wiring Board based on Screen Printed Conductors</b> .....	595
<i>J. Petaja, K. Kautio, H. Funck, M. Karppinen, P. Karioja, R. Vatanparast</i>	
<b>Investigation on Printed Wiring Board Failures During Reliability Assessment for Telecommunication Products</b> .....	601
<i>Yujie Dong, Markku Tammenmaa, Visa Ruuhonen, Virpi Pennanen</i>	

## **024 - EU & INTERNATIONAL PROGRAMMES**

<b>Global Joint Effort to Solve Microelectronics Supply Chain Technology Issues</b> .....	606
<i>Paul Collander, Marshall Andrew, Ruben Bergman</i>	
<b>Integration of Thin Flexible RF Structures into Flexible PCB</b> .....	611
<i>W. Christiaens, H. Burkard, J. Link, J. Vanfleteren</i>	
<b>3D Chip Size Packaging for Highly Integrated Memory Cards for Consumer-products</b> .....	617
<i>Reiner Gotzen, Andrea Reinhardt, Helge Bohlmann</i>	
<b>Realization of Large Area Stretchable Electronic Systems Using Lamination Processes</b> .....	620
<i>Thomas Loeher, D. Manassis, A. Ostmann, H. Reichl</i>	
<b>3DµTune: High-Q Micromachined Cavities for Millimetre-wave Filters and Oscillators</b> .....	625
<i>J.B. Mills, B. Giesbers, M. Matters-Kammerer, I. Ocket, B. Nauwelaers, A. Jourdain, W. Gautier, B. Schonlinner</i>	
<b>DAVID - A Strategic Research Project for Chip-Scale MEMS / ASIC Co-integration</b> .....	630
<i>N. Marenco, W. Reinert, S. Warnat</i>	

## **025 - SIP & EMBEDDED COMPONENTS 3**

<b>3D Package-on-Package Solution for Next Generation Cameras</b> .....	633
<i>Vern Solberg, Giles Humpston</i>	
<b>Competitive Environment for 3D Semiconductor Assembly, Applications, Strategies &amp; Cost</b> .....	639
<i>C. Bauer, H.J. Neuhaus</i>	
<b>Effects of Underfill and Molding Compounds on Reliability of System in Package</b> .....	644
<i>Shan Gao, Jupyter Hong, Jinsu Kim, Seogmoon Choi, Sung Yi</i>	
<b>Via Fabrication Techniques for High Density Vertical Interconnections</b> .....	650
<i>Zsolt Illyefalvi-Vitez, Laszlo Gal, Oliver Krammer, Janos Pinkola</i>	

## **026 - THERMAL MANAGEMENT**

<b>3D-Fluidic Cooling Structures in LTCC</b> .....	656
<i>M. Mach, J. Muller</i>	



<b>High-brightness RGB LED Modules Based on Alumina Substrate</b> .....	662
<i>Veli Heikkinen, Eveliina Juntunen, K. Kautio, Antti Kemppainen, Pentti Korhonen, J. Ollila, Aila Sitomaniemi, Timo Kemppainen, Heikki Korkala, Terho Kuttilainen, Hannu Sahavirta</i>	
<b>Performance of Thin and Thick Film Resistors Exposed to High Temperature and High Pressure (200°C @ 1000 Bar)</b> .....	668
<i>Rolf Johannessen, Froydis Oldervoll, Frode Strisland, Per Ohlckers</i>	
<b>Novel Diamond Al and Diamond Cu Composites</b> .....	673
<i>Renaud de Langlade, Maxim Seleznev</i>	

## **027 - MEDICAL ELECTRONICS**

<b>Packaging Concepts for Neuroprosthetic Implants</b> .....	677
<i>M. Topper, M. Klein, M. Wilke, H. Oppermann, S. Kim, P. Tathireddy, F. Solzbacher, H. Reichl</i>	
<b>Low Cost, Biocompatible Elastic and Conformable Electronic Circuits and Assemblies Using MID in Stretchable Polymer</b> .....	681
<i>F. Axisa, D. Brosteaux, E. De Leersnyder, F. Bossuyt, M. Gonzalez, M. Vanden Bulcke, N. DeSmet, J. Vanfleteren</i>	
<b>Packaging of an Implantable Accelerometer for Measurements of Heart Motion</b> .....	687
<i>Kristin Imenes, Knut Aasmundtveit, Ellen M. Husa, Jan Olav Hogetveit, Steinar Halvorsen, Ole Jakob Elle, Erik Fosse, Lars Hoff</i>	
<b>Development of a Reliable LTCC-BGA Module Platform for RF/Microwave Telecommunication Applications</b> .....	693
<i>Tero Kangasvieri, Olli Nousiainen, Jouko Vahakangas, K. Kautio, Markku Lahti</i>	

## **028 - NANO TECHNOLOGIES**

<b>2D and 3D X-ray Inspection for Nano-technology</b> .....	699
<i>Keith Bryant, David Bernard</i>	
<b>Author Index</b>	