

Table of Contents

Simulation and Design

Design of Micro Systems

Microsystems : a challenge for CAD development (Plenary Talk) <i>De Man, Hugo</i>	3
A specification driven environment for microsystem design (Invited Paper) <i>Müller-Glaser, Klaus D.; Rauch, H.; Wolz, W.; Bortolazzi, J.; Kuntzsch, C.; Zippelius, R.</i>	9
Conceptual design of micro-electro-mechanical systems <i>Crary, Selden; Kota, Sridhar</i>	17
Intelligent CAD for micro mechanics <i>Amster, Richard; Tavrow, Lee S.; Flynn, Anita M.</i>	23

CAD of Optical Devices

Computer aided engineering for microsystems - status and trends (Plenary Talk) <i>März, Reinhard</i>	31
Numerical simulation of optical devices <i>Weinert, C.M.; Nolting, H.-P.</i>	38
CAD-tool for integrated optic coupling gratings <i>Sychugov, V.A.; Tishchenko, A. V.; Klimov, M.S.; Parriaux, O.</i>	44
Simulation on lateral detector - optical waveguide coupling <i>Kapser, K.; Deimel, P.P.</i>	52

Simulation and Design - Electrical and Thermal Properties

Electrical connections through silicon wafer: application to 3D-multichip modules (Invited Paper) <i>Nicolas, Gerard; Dupeux, T.</i>	61
Design methods for multichip systems (Invited Paper) <i>Dümcke, Rolf</i>	71
A fully-automatic macromodeling procedure for the electrical simulation of integrated circuits <i>Turchetti, C.; V.-Kovács, Zs.M.; Masetti, G.; Conti, M.</i>	79
KOSIM - a multi-level simulator for the design of integrated circuits <i>Schwarz, Peter</i>	85
Waveform estimation and hazard detection in digital MOS circuits <i>Sass, D.; Warmers, H.; Horneber, E.-H.</i>	91
Modelling of interconnects by boundary element method <i>Włodarczyk, W.</i>	97

Thermal analysis of integrated circuits <i>Rudolph, H.; Seitzer, Dieter</i>	103
Sensitivity analysis in thermal wave measurement <i>Wiedemann, Martin</i>	109

Simulation and Design of Sensors

Design and simulation of sensors (Invited Paper) <i>Baltes, Henry</i>	117
Finite-element simulation of silicon accelerometers <i>Moser, David; Sigg, Paulo; Ansermet, Stephane; Baltes, Henry</i>	125
Accelerometer design considerations <i>Dunn, William C.</i>	131

Measurement and Testing

Testing

Development of a thermal test chip <i>Helm, Jan</i>	139
Infrared microscopy - contactless temperature measurement on miniaturized electronic components <i>Wallin, Bo</i>	146
Highly sensitive strain sensor for the qualification of epoxy compounds designed for the encapsulation of microsystems <i>Weidner, Hermann; Borner, H.; Villain, J.</i>	153

Material Characterization - Physical Properties

Mechanical reliability of electronic devices <i>Kawai, S.; Nishimura, A.; Kitano, M.; Shimizu, T.</i>	161
Measurement of internal stress in thin silicon membranes <i>Büttgenbach, S.; Engelhardt, W.; Kulcke, W.</i>	177
Measurement of the thermal diffusivity of electrically nonconducting substrates <i>Drost, A.; Hemmetzberger, D.; Emmer, J.</i>	183
Characterization of supersmooth surfaces with roughness below 0.1 nm <i>Schmitt, Dirk-Roger</i>	190

Material Characterization - Semiconductor Characteristics

Non-destructive testing of semiconductor materials using microwave photoconductivity <i>Betz, G.; Ploschies, R.; Wolk, Ch.; Winter, Ch.; Valldorf, J.</i>	199
Electrical characterization of III/V materials for heterostructure devices <i>Bach, H.G.</i>	205

Material Characterization - Optical Methods

Assessment of III-V epitaxial layers by optical methods <i>Sartorius, B.</i>	213
Ellipsometry for process control in reactive ion etching <i>Müller, Roland</i>	219
Thin film ellipsometric measurements - a tool for research and production <i>Tamme, M.; Kamilli, R.; Paduschek, P.; Stadtmüller, M.</i>	225
High precision non-contacting metrology based on short coherence interferometry <i>Jones, Robert; Hazell, M.S.; Welford, R.</i>	231
VIS-IR-ellipsometry for control and characterization of thin film processes <i>Doi, Bui Dang; Hammann, K.; Röseler, A.; Schneider, U.; Schwiecker, H.</i>	238

Materials

Materials for Packaging and Passivation

Deposition, patterning, properties, and applications of Al_2O_3 films <i>Burghardt, H.; Cebulla, H.; Leimbrock, W.; Leyffer, W.; Thess, D.; Drescher, K.</i>	247
PECVD-passivation layers for printheads in micro-system-technology <i>Unger, E.</i>	255
Hybrid integrated circuits on polycrystalline aluminium nitride <i>Philippov, Philip; Nicolov, N.</i>	261
High performance resin system for printed circuit boards <i>Huber, J.; Wilhelm, D.</i>	267
Z-axis conductive, stress free, thermally conductive adhesive films and pastes for die- and component attach <i>Chung, Kevin K.T.; Dreier, Garrett; Avery, Eldon; Boyle, Andy; Koehn, William; Govaert, Guido; Theunissen, Dirk</i>	273

Integrated Optics Materials and Technologies

Integrated optics in silicon <i>Schüppert, Bernd; Schmidtchen, J.; Splett, A.; Petermann, K.</i>	277
Integrated optics on silicon with PECVD-fabricated waveguides <i>Bezzaoui, Hocine; Baus, Andreas; Voges, Edgar</i>	283
Polymer waveguides in integrated optics <i>Keil, N.; Strebel, B.; Yao, H.H.</i>	289

Technologies

Pattern Generation and Image Transfer

Aspects of patterning inorganic-organic copolymers (ORMOCERs) <i>Popall, Michael; Meyer, H.; Schulz, J.</i>	297
Photopatternable layers from amorphous, diamond-like carbon - an innovative material for microsystems technology <i>Hammerschmidt, A.; Birkle, S.; Kammermaier, J.; Leuschner, R.; Schmidt, W.; Schulte, R.</i>	307
Submicrometer photolithography by surface imaging - experiments and simulation <i>Bauch, L.; Jagdhold, U.; Höppner, W.; Bauer, J.; Klages, R.; Mehliß, G.; Abraham, W.</i>	313
X-ray imaging system <i>Weaver, H. Joseph; Sommargren, Gary E.</i>	319

Laser Supported Deposition

Laser induced gold deposition on polyimide layers <i>Metzger, Dieter; Paredes, Alvaro; Kruck, Thomas; Reichl, Herbert</i>	325
Selective pattern deposition of SnO ₂ thin film by laser pyrolysis <i>Zhang, Binglin; Wenlou, Wei</i>	330
Plane surface embedding technique for thin film hybrids <i>Müller, Heinrich G.; Jassim, Kahtan; Buschick, Klaus; Reichl, Herbert</i>	335
Pulsed laser-plasma deposition of polycomponent thin-film structures - a review <i>Metev, S.</i>	341
Laser-induced chemical vapour deposition of thin films in microelectronics <i>Reisse, G.; Gänsicke, F.; Fischer, A.; Zimmer, K.; Zscherpe, G.</i>	348

Reactive Etching and Deposition

Plasma-assisted etching (Invited Paper) <i>Mader, H.</i>	357
Reactive etching with ECR plasma source <i>Castrischer, G.; Kretschmer, K.-H.; Lorenz, G.; Kessler, I.</i>	366
Production of resist masks by means of RIE <i>Heller, G.; Richter, K.; Kändler, E.; Güntzel A.</i>	372

Contact Methods

A new explanation for the degradation of gold-aluminium bonds <i>Haag, J. Frieder</i>	381
Simulation of the inner lead bonding process <i>Eberle, Arno</i>	389
The application of an eutectic Gold-Tin cushion for TAB-inner lead bonding with reduced bonding pressure <i>Zakel, Elke; Schuler, Siegfried; Simon, Jürgen</i>	400
Bonding techniques on microsystem in cryogenics and microelectronic engineering <i>Howitz, St.; Gerber, Dietrich</i>	407
Laser soldering of TAB inner lead bonds <i>Azdasht, Ghassem; Zakel, Elke; Reichl, Herbert</i>	413

Packaging

Solderable bumps for TAB and flip-chip bonding (Invited Paper) <i>Drescher, Kurt</i>	421
Electroless bumping <i>Simon, Jürgen; Zakel, Elke</i>	423
Hybridization of cooled mosaic sensors by indium-bumps <i>Plötner, Mathias; Blasek, G.; Sadowski, G.; Rzepka, S.</i>	429
Development of a fine pitch bumping process <i>Engelmann, Gunter; Ehrmann, Oswin; Simon, Jürgen, Reichl, Herbert</i>	435
Tape automated bonding for high-density electronic packaging <i>Plite, Gerard J.</i>	441
Adhesiveless copper-polyimide laminates for TAB's <i>Fronz, Viktor</i>	447

Optical Assembly and Interconnection Technologies

Application of micromachining and micromechanics to components for optical communication (Invited Paper) <i>Hillerich, Bernd</i>	457
Thermal tunable minimized semiconductor laser-module <i>Großmann, E.; Hilbk, U.; Peters, K.</i>	465
Micro collimated light source using micro fresnel lens <i>Goto, Hiroshi; Ito, Yoshinori; Sekii, Hiroshi; Ogata, Shiro; Imanaka, Koichi</i>	471
Monomode fused optical system elements <i>Lochmann, S.; Labs, Jürgen M.; Thiel, A.; Lang, K.D.</i>	477

Sensor and Actuator Technologies

Sensor packaging (Invited Paper) <i>Esashi, Masayoshi</i>	495
A method for thermal insulation of microstructures <i>Stoev, I.; Bogdanova, N.</i>	503
Machining of metal foils for use in microcompact heat exchangers <i>Friedrich, Craig R.; Warrington, Robert O.</i>	509
Novel stress free assembly technique for micromechanical devices <i>Offereins, H.L.; Sandmaier, H.</i>	515
The LIGA process for microsystems (Invited Paper) <i>Ehrfeld, Wolfgang</i>	521
Movable microstructures manufactured by the LIGA process as basic elements for microsystems <i>Mohr, J.; Burbaum, C.; Bley, P.; Menz, Wolfgang; Wallrabe, U.</i>	529
Ion beam techniques for micro electro mechanical systems (Invited Paper) <i>Kuwano, Hiroki</i>	538
A novel mask compensation pattern for etched microstructures with several convex corners <i>Gerlach, Gerald</i>	545
Wafer bonding and etchback techniques for silicon-on-insulator systems <i>Harendt, Christine; Appel, Wolfgang; Graf, Heinz-Gerd; Höflinger, Bernd; Penteker, Elisabeth</i>	551

Basic Components and Applications

Sensors for Physical Parameters

Silicon microsystems as an industry (Invited Paper) <i>Knutti, James W.</i>	559
Micromachined silicon devices integrated with standard IC processes <i>Riethmüller, W.</i>	562
Design of an integrated humidity sensor with digital output in double metal CMOS technology <i>Boltshauser, Thomas; Charbon, Edoardo; Baltes, Henry</i>	568
CMOS compatible capacitive pressure sensor with read-out electronics <i>Kandler, Michael; Eichholz, Jörg; Manoli, Yiannos; Mokwa, Wilfried</i>	574
Piezoresistive pressure sensors representing the 2nd generation avoid the physical limits based on conventional designs <i>Sandmaier, H.</i>	581

High performance miniaturized piezoresistive pressure transducers <i>Whittier, Robert M.</i>	587
Fully integrated silicon pressure sensor with on-chip CMOS evaluation circuit and on-chip trimming <i>Kress, H.-J.; Bantien, F.; Marek, J.; Willmann, M.</i>	593
Optimization of bipolar magneto-transistors <i>Kaneko, H.; Muro, H.; French, P.J.</i>	599
Silicon RF power sensor from DC to microwave <i>Kopystynski, P.; Obermeier, E.; Delfs, H.; Hohenester, W.; Löser, A.</i>	605
Self-testable accelerometer microsystem <i>Terry, Stephen C.; Bruin, Diederik W. de; Allen, Henry V.</i>	611
Micromechanical capacitive acceleration sensor with force compensation <i>Schlaak, H.F.; Arndt, F.; Steckenborn, A.; Gevatter, H.J.; Kiesewetter, L.; Grethen, H.</i>	617
Capacitive accelerometer made by silicon micromechanics <i>Gerlach-Meyer, U.E.</i>	623
Micromechanical acceleration sensor <i>Breng, U.; Gebner, T.; Lorenz, P.; Rauch, M.; Leyffer, W.; Dittmann, M.; Küttner, B.; Schwenzer, G.; Wetzel, M.; Zichner, N.</i>	629
CMOS readout electronics for capacitive acceleration sensors <i>Buckhorst, Rolf; Hosticka, Bedrich J.; Seidel, Helmut</i>	636

Gas and Ionic Sensors

Development of basic structures for integrated chemical sensors for SO ₂ and NH ₃ <i>Lin, J.; Möller, S.; Obermeier, E.</i>	645
Technology and application of suspended gate field effect transistors for gas detection <i>Lorenz, H.; Peschke, M.; Riess, H.; Eisele, I.</i>	651
Preparation of TiO ₂ films for oxygen sensors <i>Fischer, D.; Köppen, H.</i>	657
Solid state chemical sensors in thick film technique <i>Chu, W.F.; Erdmann, H.; Ilgenstein, M.; Leonhard, V.</i>	663
Ionic sensor layers on microelectronic structures for the detection of solvent vapours <i>Dickert, F.L.; Bertlein, G.; Reif, K.; Mages, G.; Kimmel, H.</i>	669
An integrated ISFET-sensorarray with a CMOS signal-processing circuit <i>Müller, Eckart; Koch, S.; Woias, P.</i>	675
CVD-Al ₂ O ₃ -layers: applicability in sensor devices <i>Röber, J.; Erben, E.; Cebulla, H.</i>	681

Sensors for Biological and Medical Application

Biochemical sensors for microsystems (Plenary Talk) <i>Scheller, F.W.; Hintsche, R.; Wollenberger, U.</i>	687
Miniaturised thin-film biosensors (Invited Paper) <i>Pittner, Fritz; Schalkhammer, T.; Mann-Buxbaum, E.; Urban, G.</i>	699
Chip-biosensors - integration of bioactive components with transducers made in silicon technology <i>Hintsche, Rainer</i>	706
Smart silicon system for a multi sensor catheter <i>Manoli, Yiannos; Eichholz, Jörg; Kandler, Michael; Kordas, Norbert; Langerbein, Anke; Mokwa, Wilfried</i>	710
A digital output monolithic temperature sensor for invasive applications <i>Kordas, Norbert; Eichholz, Jörg; Langerbein, Anke; Manoli, Yiannos; Mokwa, Wilfried</i>	716

Optical Sensors

New nanomechanical integrated optical devices as modulators, switches, and microphones; integrated optical (bio-)chemical sensors (Invited Paper) <i>Lukosz, W.</i>	725
High resolution interferometric displacement sensor using integrated optics in glass <i>Jestel, D.; Baus, A.; Voges, E.</i>	733
Integrated optical devices in LiNbO ₃ for sensors <i>Konz, W.</i>	739

Optical Components

Optoelectronic components and modules for multigigabit/s fibre optic transmission <i>Spalthoff, Ulrich</i>	749
Elements for integrated optics coherent receiver networks <i>Heidrich, H.; Hoffmann, D.; Nolting, H.-P.; Schlak, M.; Weinert, C.M.</i>	755
Wavelength division multiplexers for optical communication systems <i>Bornholdt, C.; Kappe, F.; Nolting, H.-P.; Stenzel, R.; Venghaus, H.; Weinert, C.M.</i>	761
Pin photodiodes and field-effect transistors for monolithically integrated InP/InGaAs optoelectronic circuits <i>Albrecht, H.</i>	767
Semiconductor laser amplifiers as multifunctional devices <i>Weber, H.G.; Großkopf, G.; Ludwig, R.; Schnabel, R.; Schunk, N.</i>	773

Fiber optical amplifiers: technology and system applications <i>Veith, Gustav</i>	779
Integrated optic polarimetric refractometer <i>Voirin, G.; Debergh, P.; Parriaux, O.; Zogmal, O.</i>	785

Actuators

Integrated fluid control systems on a silicon wafer (Invited Paper) <i>Nakagawa, Shigeru; Shoji, Shuichi; Esashi, Masayoshi</i>	793
Micro liquid-handling devices - a review <i>Pol, F.C.M. van de; Branebjerg, J.</i>	799
Electrically-activated, micromachined diaphragm valves <i>Jermain, J.Hal</i>	806
An electrohydrodynamic injection pump - a novel actuator for microsystem technology <i>Richter, Axel; Sandmaier, Hermann; Plettner, Andreas</i>	812
Electrostatic and superconducting microactuators (Invited Paper) <i>Fujita, Hiroyuki</i>	818
Levitational bearing systems by meissner effect <i>Kitamura, Tadashi; Komori, Mochimitsu</i>	826
Rotational behaviour of living cells with reference to micro-motors <i>Fuhr, G.; Hagedorn, R.; Gimsa, J.</i>	832
Magnetically driven microactuators: design considerations <i>Wagner, B.; Benecke, W.</i>	838
Development of micro grippers <i>Ando, Yasuhisa; Sawada, H.; Okazaki, Y.; Ishikawa, Y.; Kitahara, T.; Tatsue, Y.; Furuta, K.</i>	844
Micro-actuator for micro-particles <i>Nishimura, Kunitoshi</i>	850

Author Index	856
------------------------	-----