

TABLE OF CONTENTS

Preface	iii
Nanoelectronics Based Nanosystems	
Nanoscale Packaging and Nano-Bio Electronic Systems R. Tummala, P. M. Raj and Z. L. Wang	1
Process Integration of Highly Stable $1.25\mu\text{m}^2$ 6T-SRAM Cell with 45 nm Gate Length Triple Gate Transistors K. Lee, J. -H. Yang, S. Maeda, Y. -S. Jin, J. -A. Choi, S. -G. Bae, Y. -H. Kim, J. -H. Ahn, M. -C. Sun, J. -H. Ku, H. -S. Rhee, Y. -S. You, J. -Y. Kim, B. -Y. Nam, C. -J. Kang, H. -K. Kang and K. -P. Suh	16
Advanced Process Modules for Scaled ULSIs T. Mogami	32
SOI and Low-k in High-Volume Manufacturing D. Greenlaw, G. Burbach, T. Feudel, F. Feustel, K. Frohberg, F. Graetsch, G. Grasshoff, C. Hartig, K. Hempel, M. Horstmann, P. Huebler, R. Kirsch, S. Kruegel, E. Langer, A. Pawlowitsch, H. Ruelke, H. Schuehrer, R. Stephan, A. Wei, T. Werner, K. Wieczorek and M. Raab	42
Gate Dielectric Impact for the 65nm Digital and Mixed Signal Platform Applications B. Tavel	47
Ultra-High-Speed and Low-Power SOI CMOS Technology with Body-Tied Hybrid Trench Isolation Structure Y. Hirano, T. Ipposhi, D. H. Thai, T. Iwamatsu, T. Ikeda, M. Tsujiuchi, S. Maegawa, M. Inuishi and Y. Ohji	60
A 65 nm CMOS Technology Featuring Hybrid-ULK/Copper Interconnects S. Nakai, S. Fukuyama, N. Misawa, M. Miyajima, T. Sugii and K. Watanabe	65
Double-Gate FinFET Innovation: From 3-Terminal to Flexible Threshold Voltage 4-Terminal Y. Liu, M. Masahara, K. Ishii and E. Suzuki	74
Dielectrics in SI Nano-Devices: Roles and Challenges Q. Xiang, Z. Krivokapic, W. Maszara and M. -R. Lin	86

Novel Applications

Plasma Activated Wafer Bonding for Thin Silicon-On-Insulator Substrate Fabrication P. Linder, S. Farrens, V. Dragoi	97
Domain Matching Epitaxy: A New Paradigm for Epitaxial Growth of Oxides J. Narayan	103
Deposition Conditions and Post Treatment of High-k Praseodymium and Lanthanum Oxide Dielectrics G. Lippert, J. Dabrowski, P. Formanek, V. Melnik, R. Sorge, C. Wenger, P. Zaumseil, H. J. Müssig	115
All-printed Flexible Organic Thin Film Transistors: Current Status and Outlook for the Future V. Subramanian, J. M. J. Fréchet, P. C. Chang, D. C. Huang, J. B. Lee, F. Liao, B. A. Mattis, S. Molesa, A. R. Murphy, D. R. Redinger and S. K. Volkman	123
Three-Dimensional Interconnect Technology Using Polyimide Film and Gold for MMICs S. Sugitani	128
Novel Dielectric Structures for Optical Performance Enhancement in Deep Sub-Micron CMOS Image Sensor D. -N. Yang, S. -G. Wu, H. -C. Chien, T. -H. Hsu, C. -H. Tseng, J. -S. Lin, C. -H. Lo, C. -Y. Yu, C. -S. Tsai and C. S. Wang	135

Memory Applications

Dielectric Scaling Challenges and Approaches in Floating Gate Non-Volatile Memories S. N. Keeney	151
Progress and Issues in Dielectric Materials for Sub-100nm DRAM Technology K. Saino	159
High-K Materials for Tunnel Barrier Engineering in Future Memory Technologies P. Blomme, B. Govoreanu, M. Rosmeulen, A. Akheyar, L. Haspeslagh, J. De Vos, M. Lorenzini, J. Van Houdt and K. De Meyer	169
Low-k Dielectrics for DRAM Frontend-Of-Line and Mid-Of-Line A. Birner, A. Klipp, K. Mümmler, A. Thies and D. Weber	183

Recent Progress in FET-type Ferroelectric Memories H. Ishiwara	195
Highly-oriented Crystallinity of Ferroelectric Layers for Reliable FRAM Capacitors K. Maruyama, M. Tsukada, O. Matsuura, M. Kurasawa, H. Yamawaki, M. Kondo and K. Kurihara	206
 Reliability	
Extending the Reliability of SiO ₂ -Based Dielectric to the Nanometer Limit E. Y. Wu and J. Suné	213
Hot Carrier Stress and Breakdown Impact on High-frequency MOSFET Analog Performance L. Pantisano, D. Schreurs, B. Kaczer, E. Simoen and G. Groeseneken	224
Reliability Challenges for sub-90nm Technology Dielectrics H. Puchner	239
 Three Dimensional Integration	
Assessment of 3D for Future On-Chip Wiring and Novel System Solutions M. Engelhardt	250
Technology and Applications of Three-dimensional Integration R. Reif, C. S. Tan, A. Fan, K. -N. Chen, S. Das and N. Checka	261
High-Density 3-D Microsystem-in-Package Technology and Its Application for Integrated CCD Micro-Camera Visual Inspection System H. Yamada, T. Togasaki, A. Sadamoto and H. Sudo	277
SOI CMOS Circuits for System-On-Chip (SoC) Application J. Kim, J. -O. Plouchart, B. J. Gross and T. Sandwick	292
Dielectric Adhesive Wafer Bonding for Back-End Wafer-Level 3D Hyper-Integration J. -Q. Lu, T. S. Cale and R. J. Gutmann	312

Materials Science, Processing and Manufacturing

HfSiON Gate Dielectrics for Low-Stand-By Power CMOS Devices K. Sekine, S. Inumiya, A. Kaneko, M. Sato, I. Hirano, T. Yamaguchi, K. Eguchi and Y. Tsunashima	324
Characteristics of Self-Assembled Ultra-Low- <i>k</i> Porous Silica Films Y. Oku, N. Fujii, K. Kohmura, K. Yamada, N. Hata, Y. Seino, R. Ichikawa, N. Nishiyama, S. Tanaka, H. Miyoshi, S. Oike, H. Tanaka, S. Takada, C. Negoro, A. Nakano, T. Ogata, T. Goto, Y. Sonoda, A. Ishikawa, T. Yoshino, H. Matsuo, K. Kinoshita, K. Ueyama and T. Kikkawa	331
Hydrogen/Deuterium Implantation For SI-Dielectric Interface in Nanoscale Devices T. Kundu and D. Misra	346
Manufacturing Solutions for Developing Processes and Tools for CVD/ALD of Dielectrics for Nanoelectronics R. Singh, D. Damjanovic, H. K. Bolla, K. F. Poole and J. Narayan	356
Ald HfSiO High- <i>k</i> Dielectric and CVD-TaN Metal Gate U. I. Chung, S. G. Park, H. -J. Cho, H. L. Lee, H. B. Park, T. S. Jeon, B. J. Jin, S. B. Kang, Y. G. Shin and J. T. Moon	362
A Study of Aluminum Gate La ₂ O ₃ nMISFET with Post Metallization Anneal J. -A. Ng, S.-I. Ohmi, K. Tsutsui and H. Iwai	369
Time Dependent Dielectric Breakdown of Thermally Evaporated HfO ₂ for Nanoscale Devices N. A. Chowdhury, R. Garg and D. Misra	381
Suppression of Surface Micro-Roughness on Si(110) K. Nii, H. Akahori, M. Yamamoto, A. Teramoto and T. Ohmi	392
Microstructure Evolution and Breakdown Mechanism Studies in MOSFET with Ultra Thin Gate Dielectrics in Nanometer Technology ERA C. Y. Lu, C. H. Tung and K. L. Pey	404
Atomic-Layer Deposition of Ultrathin Silicon Nitride for Sub-Tunneling Gate Dielectrics A. Nakajima and S. Yokoyama	418
Thermally Oxidized HfO ₂ on Se-Passivated n-Type Si(100) M. Tao, X. Yang and W. P. Kirk	425

Effects of Low temperature NH ₃ Treatment on HfO ₂ /SiO ₂ Stack Gate Dielectrics Fabricated by MOCVD System	434
W. -T. Lu, C. -H. Chien, Y. -C. Lin, M. -J. Yang and T.-Y. Huang	
Towards 0.5 nm EOT Scaling of HfO ₂ /Metal Electrode Gate Stacks	443
J. J. Peterson, G. A. Brown, K. Matthews, J. Gutt, S. Gopalan, H. -J. Li, P. Kirsch, J. Barnett, N. Moumen, C. Huffman, P. Majhi, N. Chaudhary, C. D. Young, B. Sassman, B. -H. Lee, G. Bersuker, P. M. Zeitzoff, P. Lysaght, M. Gardner, R. W. Murto and H. R. Huff	
Electrical Conduction Process in Lanthana Thin Films Prepared by E-Beam Evaporation	452
Y. Kim, S.-I. Ohmi, K. Tsutsui and H. Iwai	
Effects of Nitrogen in HfO ₂ Gate Dielectric on the Electrical and Reliability Characteristics by N ₂ plasma	464
J. -H. Kim, K. -J. Choi and S. -G. Yoon	
Effects of the Wet Air on the Properties of the Lanthanum Oxide and Lanthanum Aluminate Films	470
J. H. Jun and D. J. Choi	
Subject Index	477
Author Index	484