TABLE OF CONTENTS

PREFACE v

ELECTRONICS DIVISION AWARD ADDRESS

Radical Reaction Based Semiconductor Manufacturing for Very Advanced ULSI Process Integration* 3
T. Ohmi

KEYNOTE PAPERS

From Ambient Intelligence to Silicon Process Technology * 7
C.J. van der Poel

From the Lab to the Fab: Transistors to Integrated Circuits * 15
H. R. Huff

Diffused Silicon Transistors and Switches (!954-1955): The Beginning of Integrated Circuit Technology * 68
N. Holonyak Jr.

Current Status and Future Prospects in Mixed Signal SOC * 107
A. Matsuzawa

PROCESS INTEGRATION FOR MEMORY DEVICES

DRAM Technology for 100nm and Beyond * 123
K.H. Küsters, J. Alsmeier, J. Faul, J. Lützen and T. Zell

Logic Based Embedded DRAM Technologies* 133
C. Mallardeau

Flash Memory Technology Evolution* 136
R. Bez and E. Camerlenghi

FeRAM Technology: Today and Future * 149
I. Kunishima and N. Nagel

Effects of Nitridation Treatment for Electrochemical Properties of MONOS Non-Volatile Memories 152
H. Aozasa , I. Fujiwara, K. Nomoto, H. Komatsu and T. Kobayashi

The Crystallization Behavior and Interfacial Reaction of $Ge_2Sb_2Te_5$ Thin Films Between Dielectric Material for the Application to the Phase Change Memory 159
E.J. Jung, S.K. Kang, B.G. Min and D.H. Ko

* Invited paper

FULL PROCESS INTEGRATION ASPECTS

Single-Wafer Technology in a 300-mm Wafer Fab* 163
S. Ikeda, K. Nemoto and M. Funabashi

The Impact of Single Wafer Processing on Process Integration* 171
R. Singh, M. Fakhruddin and K.F. Poole

Advanced Multilevel Interconnects Technologies for 40-nm Lg Devices* 183
T. Ohba

Performance Limitations of Metal Interconnects and Possible Alternatives* 194
K.C. Saraswat, P. Kapur and S. Souri

Plasma Technologies for Low-k Dry Etching* 206
T. Tatsumi

A Novel Approach to Contact Integration at 90-nm and Beyond 217
A. Singhal, T. Sparks, K. Strozewski, F. Huang, S. Parihar, J. Schmidt, B. Boeck, J. Fretwell, G. Yeap, V. Sheth, S. Veeraghavan and B. Melnick

SiGe PROCESS INTEGRATION

BiCMOS Integration of High-Speed SiGe:C HBTs* 223
H. Rücker, B. Heinemann, R. Barth, D. Knoll, D. Schmidt and W. Winkler

Applications of Silicon Germanium Electrodes in ULSI * 230
E.-X. Ping, E. Blomiley and F. González

Noise Properties and Hetero-Interface Traps in SiGe-Channel PMOSFETs* 241
T. Tsuchiya and J. Murota

Ultra-Shallow Junction Formation by Low Energy Ion Implantation and Flash Lamp Annealing* 253
K. Suguro, T. Ito, T. Itani and T. Iinuma

INTEGRATION ASPECTS FOR EMERGING TECHNOLOGIES

Single and Few Electron Devices. Integration Trends* 263
J. Gautier

Achieving Low Junction Capacitance on Bulk Si MOSFET Using SDOI Process* 266
Z. Wang, T. Abbott, J. Trivedi, C.-C. Cho and M. Violette

* Invited paper

Differential Silicide Thickness for ULSI Scaling* 278
W.J. Taylor Jr., J. Smith, J.-Y. Nguyen, R. Rai, O. Adetutu, J. Geren, J. Ybarra and D. Petru

High-Voltage CMOS and Scaling Trends* 288
H. Ballan

Emerging Device Solutions for the Post-Classical CMOS Era* 291
K. De Meyer, N. Collaert, S. Kubicek, A. Kottontharayil, H. van Meer and P. Verheyen

Modeling End-of-the-Roadmap Transistors* 306
A. Asenov, A.R. Brown and J.R. Watling

Thin Film Transistors in ULSI –Status and Future* 322
Y. Kuo

Extending Planar Single-Gate CMOS & Accelerating the Realization of Double-Gate/Multi-Gate CMOS Devices* 330
J.O. Borland, H. Iwai, W. Maszara and H. Wang

SURFACE PREPARATION AND GATE MODULE

Cleaning for Sub 0.1 μm Technology: A Particular Challenge* 349
D.M. Knotter

Si Channel Surface Dependence of Electrical Characteristics in Ultra-Thin Gate Oxide CMOS* 361
H.S. Momose

Integration Issues with High k Gate Stacks* 375
C.M. Osburn, S.K. Han, I. Kim, S.A. Campbell, E. Garfunkel, T. Gustafson, J. Hauser, T.-J. King, Q. Liu, P. Ranade, A. Kingon, D.-L. Kwong, S.J. Lee, C.H. Lee, J. Lee, K. Onishi, C.S. Kang, R. Choi, H. Cho, R. Nich, G. Lucovsky, J.G. Hong, T.P. Ma, W. Zhu, Z. Luo, J.P. Maria, D. Wicaksana, V. Misra, J.J. Lee, Y.S. Suh, Z. Luo, G. Parksons, D. Niu and S. Stemmer

Compatibility of Polysilicon with HfO_2-based Gate Dielectrics for CMOS Applications 391
V. Kaushik, S. De Gendt, M. Caymax, E. Young, E. Rohr, S. Van Elshocht, A. Delabie, M. Claes, X. Shi, J. Chen, R. Carter, T. Conard, W. Vandervorst, M. Schaekers and M. Heyns

Analysis of CMOS Gate-To-Drain Leakage Current and Proposition of a New Cobalt Salicide Selective Etch Chemistry for High DRAM Yield 397
B. Froment, C. Régnier and M.-T. Basso

* Invited paper

Electrical Characteristics and Thermal Stability of $W_2N/Ta_2O_5/Si$ MOS Capacitors in N_2 :H_2 or H_2 Ambients 400
P.C. Jiang and J.S. Chen

Sub-Quarter Micron PMOSFET DC and AC NBTI Degradation 408
E. Li, S. Prasad, S. Park and J. Walker

PROCESS INTEGRATION IN INTEGRATED CIRCUIT APPLICATIONS

Physical Analysis and Modeling of Plasma Etching Mechanism for ULSI Application* 421
M. Kanoh, S. Onoue, K. Nishitani, T. Shinmura, K. Iyanagi, S. Kinoshita and S. Takagi

Process Strategy for Built-in Reliability of Cu Damascene Interconnect System for 0.13um-Node and Beyond * 434
H. Yamaguchi, T. Oshima, J. Noguchi, K. Ishikawa, H. Aoki, T. Saito, T. Furusawa and K. Hinode

Impact of Wafer Backside Cu Contamination to 0.18 um Node Devices 447
S.Q. Gu, L. Duong, J. Elmer and S. Prasad

Integrated Multiscale Process Simulation of Damescene Structures 455
M.O. Bloomfield, Y.H. Im, J. Seok, C.P. Sukam, J.A. Tichy and T.S. Cale

An Analysis of the Effect of the Steps for Isolation Formation on STI Process Integration 467
A. Pavan, D. Brazzelli, M. Aiello, C. Capolupo, C. Clementi, C. Cremonesi and A. Ghetti

Defect Generation and Suppression in Device Processes Using a Shallow Trench Isolation Scheme 477
D. Peschiarolli, M. Brambilla, G.P. Carnevale, A. Cascella, F. Cazzaniga, c. Clementi, C. Cremonesi, A. Gilardini, M. Martinelli, A. Maurelli, I. Mica, A. Pavan, G. Pavia, F. Piazza, M.L. Polignano, V. Soncini and E. Bonera

Electrodeposition of Low-Dimensional Phases on Au Studied by EQCM and XRD 489
C. Shannon

* Invited paper

SILICON-ON-INSULATOR

60-nm Gate Length SOI CMOS Technology Optimized for "System-on-a-SOI-Chip" Solution* 493
K. Imai, S. Maruyama, T. Suzuki, T. Kudo, S. Miyake, M. Ikeda, T. Abe, S. Masuda, A. Tanabe, J.-W. Lee, K. Shibahara, S. Yokoyama and H. Ooka

Emerging Silicon-On-Nothing (SON) Devices Technology* 503
T. Skotnicki, S. Monfray and C. Frenouillet-Beranger

High Performance Strained-SOI CMOSFETs* 518
S.-I. Takagi, T. Mizuno, T. Tezuka, N, Sugiyama, T. Numata, K. Usuda, Y. Moriyama, S. Nakaharai, J. Koga, A. Tanabe and T. Maeda

Extremely Scaled Ultra-Thin Body and FinFET CMOS Devices* 534
S. Balasubramanion, L. Chang, Y.-K. Choi, D. Ha, J. Lee, P. Ranade, S. Xiong, J. Bokor, C. Hu and T.-J. King

Fully Depleted SOI Process and Device Technology for Digital and RF Applications* 546
F. Ichikawa, Y. Nagatomo, Y. Katakura, S. Itoh, H. Matsuhashi, N. Hirashita and S. Baba

Status and Future Development of PDSOI MOSFETs* 556
S. Krishnan

Multi-fin Double Gate MOSFET Fabricated by Using (110)-Oriented SOI Wafers and Orientation dependent Etching 566
Y.X. Liu, K. Ishii, T. Tsutsumi, M. Masahara, H. Takashima and E. Suzuki

Optimization of Ultra-Thin Body, Fully-Depleted-SOI Device, with Raised Source/Drain or Raised Extension 572
J.L. Egley, A. Vandooren, B. Winstead, E. Verret, B. White and B.-Y. Nguyen

Partially Depleted SOI Dynamic Threshold MOSFET for Low-Voltage and Microwave Applications 578
M. Dehan, D. Vanhoenacker-Janvier and J.-P. Raskin

New Characterization Techniques for SOI and Related Devices* 584
S. Okhonin, M. Nagoga and P. Fazan

Authors Index 587

Subject Index 591

* Invited paper