

The Electrochemical Society

2007 International Conference on Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors (ULSIC vs. TFT)

ECS Transactions Volume 8 No.1

July 29 – August 3, 2007
Barga, Italy

Printed from e-media with permission by:

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

ISBN: 978-1-60423-892-1

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

Copyright 2007 by The Electrochemical Society, Inc.
All rights reserved.

This book has been registered with Copyright Clearance Center, Inc.
For further information, please contact the Copyright Clearance Center,
Salem, Massachusetts.

Published by:

The Electrochemical Society, Inc.
65 South Main Street
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902
Fax 609.737.2743
e-mail: ecs@electrochem.org
Web: www.electrochem.org

ISSN 1938-6737 (online)
ISSN 1938-5862 (print)

Printed in the United States of America

ECS Transactions, Volume 8, Issue 1
2007 International Conference on Semiconductor Technology for Ultra Large Scale
Integrated Circuits and Thin Film Transistors (ULSIC vs. TFT)

Table of Contents

Preface

Chapter 1
Challenges in Scaling and System

Low-Temperature Polysilicon History and A CPU with an Operating Frequency in the GHz Range <i>S. Yamazaki</i>	3
Performance Limitations of Si Bulk CMOS and Alternatives for future ULSI <i>K. C. Saraswat, D. Kim, T. Krishnamohan and A. Pethe</i>	9
Electrical Performance and Reliability Aspects of Strain Engineered Deep Submicron CMOS Technologies <i>C. Claeys, G. Eneman, M. Bargallo Gonzalez, S. Put and E. Simoen</i>	15
Technology Trend and Application of TFT-LCDs <i>Y. Yamamoto and C. Brown</i>	23
The Small Differences between 45nm and 45 inches <i>C. Reita</i>	29
Device Performance and Reliability of Fully Developed SOI Transistors and Low-Temperature Poly-Si TFTs <i>M. Matsumura, M. Hatano, H. Hamamura, T. Mitsuharu, Y. Toyota and M. Ohkura</i>	33
TFT Technologies for Large Area Electronics <i>J. Jang</i>	39
ULSIC vs. TFT - What Can They Learn from Each Other? <i>Y. Kuo</i>	45
Improvement of Silicon-Based Thin Film Transistor Performances by Modifying Technological Fabrication Process Steps: a Similar Approach with ULSI Technology <i>O. Bonnaud and T. Mohammed-Brahim</i>	51

CPU for HF and UHF Operation on the Glass and Flexible Substrates	57
<i>J. Koyama, Y. Kurokawa, T. Ikeda, M. Endo, H. Dembo, D. Kawae, T. Inoue, M. Kozuma, D. Ohgarane, S. Saito, K. Dairiki, H. Takahashi and S. Yamazaki</i>	

Chapter 2 Challenges in Devices

Leakage Current-Free Pixel Structure Using a Blocking Transistor for Active-Matrix Display	65
<i>H. Park, W. Lee, S. Kuk and M. Han</i>	
Investigation of Hump Degradation by F-N stress for Narrow Width n-MOSFETs with Shallow Trench Isolation (STI)	71
<i>J. Seo, J. Seok, H. Kim, S. Lee, J. Jeon, Y. Kim and W. Lee</i>	
The Hysteresis Phenomenon in a-Si:H TFT and Poly-Si TFT in AMOLED	77
<i>S. Park, J. Lee, H. Shin, S. Choi and M. Han</i>	
Verase Improvement for Split-gate Embedded Flash Through Poly Grain Size Reduction	83
<i>H. Ng and H. Tan</i>	

Chapter 3 Challenges in Dielectrics and Semiconductors

Electrical Characterization of Advanced Gate Dielectrics for Scaled CMOS Technology	93
<i>T. Ma</i>	
High and Low Stress Voltage Instabilities in High-K Gate Stacks	99
<i>G. Bersuker, C. Young, D. Heh, R. Choi, B. H. Lee and R. Jammy</i>	
Spectroscopic Studies of Band Edge Electronic and Defect States in Elemental High-k Oxide Dielectrics and Si Oxynitride Alloys onto Si(100) Substrates	105
<i>G. Lucovsky, H. Seo, L. Fleming, M. Ulrich and J. Lüning</i>	
Improved Electrical Characteristics of MOS Devices with Ultrathin Gate Oxide Grown by Chemical Oxidation	111
<i>B. J. Kailath, A. DasGupta and N. DasGupta</i>	

Study of Structure and Electrical Characteristics of Silicon Oxynitride Layers Synthesized by Dual Ion Implantation in Silicon and their Annealing Behaviour <i>A. D. Yadav, G. Bhatt and D. K. Dubey</i>	117
Defects and Defect Precursor Reductions in Non-Crystalline Thin Films: Intermediate Phases Generated by Chemical Bonding Self-Organizations <i>G. Lucovsky, J. Phillips and S. Kasap</i>	125
InN Nanostructured Materials: Controlled Synthesis, Characterizations, and Applications <i>J. Mangum, O. Kryliouk, H. J. Park, T. J. Anderson and Z. Liliental-Weber</i>	131

Chapter 4 **Challenges in Interconnects, Contacts, and Defects**

Air Cavity Generation for Interconnect and High Resolution Displays <i>P. A. Kohl</i>	139
Nanostructure and Morphology of Electrodeposited Copper Metallization during Room-Temperature Aging <i>D. N. Buckley, S. Ahmed, T. T. Ahmed and S. Nakahara</i>	145
Heterojunctions between Silicon and the Semiconducting Metal Silicides β -FeSi ₂ and MgSi ₂ <i>M. I. Baleva, E. Goranova, M. Marinova and A. Atanasov</i>	151
Electromigration Reliability Assessment of Cu-based Metallization Systems by a Wafer-Level Approach <i>M. Impronta, A. Marras, I. De Munari, A. Scorzoni and M. Valentini</i>	157

Chapter 5 **Challenges in Modeling, Theories, etc.**

Modeling Of Thin Film Transistors with Non-Ideal Contacts <i>M. Shur, D. Veksler, V. Chivikula, A. Koudymov, T. Ytterdal, B. Iñiguez and W. Jackson</i>	165
SPICE Modeling of Single-Grain Si TFTs using BSIMSOI <i>A. Baiano, R. Ishihara, N. Saputra, J. Long, N. Karaki, S. Inoue, W. Metselaar and K. Beenakker</i>	171
Physics-Based Percolation Model of Oxide Breakdown <i>J. Sune, E. Wu and S. Tous</i>	177

Atomic-Scale Analyses of Non-Equilibrium Surface Reactions During Plasma Processing 185

S. Hamaguchi, M. Yamashiro and H. Yamada

Controlling the Nucleation Site and Crystal Orientation during Eximer-laser Annealing Processes in Thin Amorphous Si Films on Glass: A Molecular-dynamics Study 191

T. Motooka, S. Munetoh, R. Kishikawa, T. Mitani and T. Ogata

Chapter 6 Challenges in Processes

Large Area Flexible Electronics Fabricated Using Self-Aligned Imprint Lithography 199

W. Jackson, M. Almanza-Workman, A. Chaiken, R. Garcia, A. Jeans, H. Kim, O. Kwon, H. Luo, P. Mei, C. Perlov, C. Taussig, M. Shur and A. Koudymov

Surface-Treatment Effects on Organic Thin-Film Transistors by Atmospheric-Pressure Plasma Technology. 205

K. Chang, C. Lin, S. Huang and C. Su

Grain Boundary Characterisation in Sequentially Laterally Solidified Polycrystalline-Silicon Thin Film Transistors 211

A. Valletta, A. Bonfiglietti, M. Rapisarda, A. Pecora, L. Mariucci, G. Fortunato and S. D. Brotherton

New LC (Laser Crystallization) Method for GHz Level TFT Operation 217

K. Tanaka, T. Omata, T. Moriwaka, H. Oishi and S. Yamazaki

Demonstration of High Performance TFTs on Silicon-on-Glass (SiOG) Substrate 223

D. F. Dawson-Elli, C. A. Kosik Williams, J. G. Couillard, J. S. Cites, R. G. Manley, G. Fenger and K. D. Hirschman

Alternative Substrates 229

S. H. Won, Y. Jung and D. G. Ast

Chapter 7 **Challenges in Reliability**

Dielectric Reliability for Future Logic and Non-Volatile Memory Applications: a Statistical Simulation Analysis Approach <i>A. Padovani, L. Larcher, A. Chimenton, P. Pavan and P. Olivo</i>	237
Bathtub-Shaped Hazard Rate Function for Ultra-thin Gate Dielectrics <i>T. Yuan, W. Kuo and Y. Kuo</i>	243
Reliability of High Performance Short Channel Polycrystalline Silicon Thin Film Transistor on the Glass Substrate <i>H. Shin, I. Song, J. Park and M. Han</i>	249
Moisture Induced Accelerated Aging of an Amorphous Silicon TFT-Photodiode Array <i>W. A. Hennessy, D. Albagli and A. J. Couture</i>	255
Radiation Exposure Effect on Amorphous Silicon Thin Film Transistors <i>H. Nominanda, Y. Kuo, C. Chen and C. Hwang</i>	261
In-line Automatic Defect Inspection and Repair Method for a High Yield TFT Array Production <i>H. Honoki, N. Nakasu, T. Arai, K. Yoshimura and T. Edamura</i>	267

Chapter 8 **Challenges in Applications**

Transparent OTFTs with Color-Filtering Functional Gate Insulators <i>C. Chuang, F. Chen and H. D. Shieh</i>	275
Transistor and Circuit Operation of Complimentary Organic Thin Film Devices <i>Y. S. Yang, S. H. Kim, S. C. Lim, J. H. Lee and C. H. Ku</i>	283
Intelligent Pixel Architectures for Digital Medical Imaging Applications <i>K. Karim, M. Izadi, F. Taghibakhsh and G. Sanaie</i>	289
Author Index	295