IEEE TRANSACTIONS ON
VERY LARGE SCALE INTEGRATION (VLSI) SYSTEMS

A JOINT PUBLICATION OF THE IEEE CIRCUITS AND SYSTEMS SOCIETY
THE IEEE COMPUTER SOCIETY
THE IEEE SOLID-STATE CIRCUITS SOCIETY

AUGUST 2016 VOLUME 24 NUMBER 8 ITCOB4 (ISSN 1063-8210)

EDITORIAL
First TVLSI Best AE and Reviewer Awards .......................................................... K. Chakrabarty and M. Alioto 2613

REGULAR PAPERS

Memories
Precharge-Free, Low-Power Content-Addressable Memory ............................... M. Zackriya V and H. M. Kittur 2614
A Low-Voltage Radiation-Hardened 13T SRAM Bitcell for Ultralow Power Space Applications ................................................................. L. Atias, A. Teman, R. Giterman, P. Meinerzhagen, and A. Fish 2622
Single-Ended Schmitt-Trigger-Based Robust Low-Power SRAM Cell ................... S. Ahmad, M. K. Gupta, N. Alam, and M. Hasan 2634

Application-Specific Circuits and Subsystems
Reduced-Complexity Nonbinary LDPC Decoder for High-Order Galois Fields Based on Trellis Min–Max Algorithm .................................................. J. O. Lacruz, F. García-Herrero, M. J. Canet, and J. Valls 2643
Exploiting Intracell Bit-Error Characteristics to Improve Min-Sum LDPC Decoding for MLC NAND Flash-Based Storage in Mobile Device ......................... H. Sun, W. Zhao, M. Lv, G. Dong, N. Zheng, and T. Zhang 2654
Low-Power FPGA Design Using Memoization-Based Approximate Computing .................. S. Sinha and W. Zhang 2665
Low-Power System for Detection of Symptomatic Patterns in Audio Biological Signals ......................................................... H. S. Markandeya and K. Roy 2679

Resiliency and Robust Design
System-Level Modeling of Microprocessor Reliability Degradation Due to Bias Temperature Instability and Hot Carrier Injection ................................................. C.-C. Chen, T. Liu, and L. Milor 2712
Enhanced Built-In Self-Repair Techniques for Improving Fabrication Yield and Reliability of Embedded Memories ........................................... S.-K. Lu, C.-J. Tsai, and M. Hashizume 2726
Reliable Power Gating With NBTI Aging Benefits ................................................. D. Rossi, V. Tenentes S. Yang, S. Khursheed, and B. M. Al-Hashimi 2735

(Contents Continued on Back Cover)
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Test Selection Procedure for Improving the Accuracy of Defect Diagnosis</td>
<td>I. Pomeranz</td>
<td>2759</td>
</tr>
<tr>
<td><strong>Timing and Intradie/Interdie Communication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 4 × 5-Gb/s 1.12-μs Locking Time Reference-Less Receiver With Asynchronous Sampling-Based Frequency Acquisition and Clock Shared Subchannels</td>
<td>J. Song, S. Hwang, and C. Kim</td>
<td>2768</td>
</tr>
<tr>
<td>Noise Coupling Models in Heterogeneous 3-D ICs</td>
<td>B. Vaisband and E. G. Friedman</td>
<td>2778</td>
</tr>
<tr>
<td>Accelerated Accurate Timing Yield Estimation Based on Control Variates and Importance Sampling</td>
<td>A. A. Bayrakci</td>
<td>2787</td>
</tr>
<tr>
<td><strong>TRANSACTIONS BRIEFS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficient High-Level Synthesis for Nested Loops of Nonrectangular Iteration Spaces</td>
<td>H. Sim, A. Rahman, and J. Lee</td>
<td>2799</td>
</tr>
<tr>
<td>An Equalizer With Controllable Transfer Function for 6-Gb/s HDMI and 5.4-Gb/s DisplayPort Receivers in 28-nm UTBB-FDSOI</td>
<td>P. S. Sahni, S. C. Joshi, N. Gajria, and G. S. Visweswaran</td>
<td>2803</td>
</tr>
<tr>
<td>A Flexible-Weighted Nonbinary Searching Technique for High-Speed SAR-ADCs</td>
<td>L. Qiu, K. Tang, Y. Zheng, and L. Siek</td>
<td>2808</td>
</tr>
</tbody>
</table>