



**IEEE SOLID-STATE  
CIRCUITS SOCIETY**  
Where ICs are in IEEE

**June 2017**

## **EDUCATION**



### **Upcoming Webinar**

**LED-Based Visible Light  
Communication Systems - Driver  
SoC Design and Practical  
Applications**

**Presented by Patrick Yue**

**Thursday, July 20 @ 11:00 AM (ET)**

**\*Professional Development Hours  
can be requested for this webinar\***

**[CLICK HERE TO REGISTER!](#)**

**This webinar was prerecorded. Prof. Patrick Yue will be available during the presentation to answer questions regarding content, formulas, or theories. Please follow the link to register for the webinar which is free and open to all SSCS members.**

**Abstract:** This talk presents two advanced visible light communication (VLC) modulator system-on-chips (SoCs). The first is an IEEE 802.15.7 PHY-I standard compliant VLC transmitter. The

second is an active matrix LED microdisplay driver SoC with embedded VLC function. Using ordinary LED lights for VLC has received a great deal of research interest over the past decade due to a number of novel applications including location-based wireless broadcasting through LED lightings, signs with LED backlights and digital LED displays. Most of the VLC SoCs development has focused on wireless optical receiver design including custom CMOS imager whereas VLC transmitters have been predominately based on discrete implementation until recently. More importantly, the power consumption of dedicated VLC transmitters is prohibitively high with bit efficiency in the 100 nJ/bit range. To overcome these issues, this work demonstrates the first fully integrated VLC transmitter SoC compliant with the IEEE 802.15.7 standard embedded with a built-in 8-W LED driver. Excluding the power consumed by the LED driver, the SoC achieves a record VLC transmission efficiency of 5nJ/bit. On the other hand, the miniaturization and integration of inorganic LED display modules have attracted significant research efforts due to their superior brightness and reliability compared to organic LED microdisplay. Combining these two technology trends, this paper also describes an active matrix LED (AMLED) driver SoC with built-in VLC modulation capability to demonstrate a WQVGA smart microdisplay featuring 1.25-Mb/s VLC for enabling LED digital signage as location-based information broadcaster and indoor positioning beacons.

**Bio:** Prof. C. Patrick Yue (S'93-M'98-SM'05-F'15) received the B.S. degree from the University of Texas at Austin in 1992 with highest honor and the M.S. and Ph.D. degrees in Electrical Engineering from Stanford University in 1994 and 1998, respectively. He has been a Professor in Electronic and Computer Engineering at the Hong Kong University of Science and Technology (HKUST) since 2010. Between 2014 and 2015, he served as the Associate Provost for Knowledge Transfer. He is also the Founding Director of the HKUST-Qualcomm Joint Innovation and Research Lab and the Center of Industry Engagement and Internship in the School of Engineering. His current research interests focus on system-on-a-chip design for high-speed fiber-optic communication, visible light communication, and wireless power transfer for bio-implants.

In 1998, Prof. Yue cofounded Atheros Communications (now Qualcomm-Atheros). While working in Silicon Valley, he served as a Consulting Assistant Professor at Stanford. In 2003, he joined Carnegie Mellon University as an Assistant Professor. In 2006, he moved to University of California Santa Barbara and was promoted to Professor in 2010. He has contributed to more than 130 peer-reviewed papers, 2 book chapters and holds 14 U.S. patents. He has served on the committees of IEEE Symposium on VLSI Circuits (VLSI-

Circuits), IEEE European Solid-State Circuits Conference (ESSCIRC), IEEE MTT-S International Wireless Symposium (IWS), IEEE RFIC Symposium (RFIC), IEEE Asian Solid-State Circuits Conference (A-SSCC) and other IEEE-sponsored conferences. He was an Editor of the IEEE Electron Device Letters and IEEE Solid-State Circuit Society Magazine. He was a co-recipient of the 2003 International Solid-State Circuits Conference (ISSCC) Best Student Paper award and the 2016 IEEE International Wireless Symposium Best Student Paper award. He is an Elected AdCom Member of the IEEE Solid-State Circuit Society. In 2016, Prof. Yue received the 11th Guanghua Engineering Science and Technology Youth Award by the Chinese Academy of Engineering (CAE). Prof. Yue is an IEEE Fellow and a Senior Member of Optical Society of America.

## Upcoming Distinguished Lecturer Events in July

	<b>SPEAKER</b>	<b>CHAPTER</b>	<b>TOPIC</b>
July 4	Marian Verhelst	SSCS France	Topic: TBD For more details, <a href="#">please click here.</a>
June 31	Naveen Verma	SSCS Taipei	Topic: Exploiting Data-driven Inference Towards Low-energy Implementations in Intelligent Sensors  For more details, <a href="#">please click here.</a>

For more information on upcoming Distinguished Lecturer Tours, [CLICK HERE.](#)

## CONFERENCES

### Upcoming Conferences

<a href="#"><u>2017 IEEE/ACM International Symposium on Low Power Electronics and Design (ISLPED)</u></a> Taiwan	July 24 - 26, 2017
<a href="#"><u>2017 European Solid-State Circuits Conference (ESSCIRC)</u></a> Belgium	Sept 11 - 14, 2017
<a href="#"><u>2017 IEEE Biomedical Circuits and Systems</u></a>	October 19 - 21, 2017

<u>Conference (BioCAS)</u> Italy	
<u>2017 IEEE Bipolar/BiCMOS Circuits and Technology Meeting - BCTM</u> Florida	October 19 - 21, 2017
<u>2017 IEEE Asian Solid-State Circuits Conference (A-SSCC)</u> Korea (South)	November 6 - 8, 2017
<u>2018 International Solid-State Circuits Conference (ISSCC)</u> San Francisco, CA	February 11 - 15, 2018

## CALL FOR PAPERS

### 2018 IEEE International Solid-State Circuits Conference (ISSCC) - Call for Papers

Continued advances in solid-state circuits and systems have brought evermore powerful communication and computation capabilities into mobile form factors. These ubiquitous smart devices lie at the heart of a revolution shaping how we connect, collaborate, build relationships, and share information. Such social technology allows people to maintain connections and support networks that otherwise would not be possible; it provides the ability to access information instantaneously and from any location, helping to shape the world's events and culture. Thereby, citizens of all nations are more empowered than ever before, and social networks allow worldwide communities to develop and bond through common interests. ISSCC 2018 is seeking innovations that will bring further progress in developing a truly-connected social world.

Innovative and original papers are solicited in subject areas including (but not limited to) the following:

**ANALOG:** Amplifiers, comparators, oscillators, filters, references; nonlinear analog circuits; digitally-assisted analog circuits; sensor interface circuits.

**DATA CONVERTERS:** Nyquist-rate and oversampling A/D and D/A converters.

**DIGITAL ARCHITECTURES & SYSTEMS:** Microprocessors, micro-controllers, applications processors, graphics processors; systems for communications, video and multimedia, machine-learning, deep-learning, neuromorphism, cryptographics, special function acceleration, processing-in-memory, FPGA/reconfigurable systems, system-level power management, near-threshold/subthreshold systems, digital architectures and systems for emerging applications (e.g. virtual reality, autonomous vehicles).

**DIGITAL CIRCUITS:** Building blocks for 2D/3D SoC, including: special-purpose digital circuits, intra-chip communication circuits, clock-distribution techniques, soft-error and variation-tolerant circuits; Circuits for power management in digital applications, including, digital/synthesizable voltage regulators and PLLs, digital sensors, adaptive circuits; Subthreshold and Near-threshold circuits; Circuits for neuro-computing; Hardware-security circuits including PUFs, TRNGs, crypto-circuits, side-channel-attacks mitigation.

**IMAGERS, MEMS, MEDICAL, & DISPLAY:** Image sensors and companion chips; image-sensor SoCs; MEMS-based integrated systems; ultrasonic sensors, neural interfaces and closed-loop systems; biosensors, microarrays, and lab-on-a-chip; wearable electronics; biomedical SoCs; display and touch electronics, flexible displays, and displays with integrated sensing functionality.

**MEMORY:** Static, dynamic, and non-volatile memories for stand-alone and embedded applications; memory/SSD controllers; high-bandwidth I/O interfaces; memories based on

phase-change, magnetic, spin-transfer-torque, ferroelectric, and resistive materials; array architectures and circuits to improve low-voltage operation, power reduction, bit-error management, reliability, and fault tolerance; memory-subsystem enhancements, including in-memory logic functions.

**POWER MANAGEMENT:** Power control and management circuits, regulators; switched-mode power supplies, using inductive, capacitive, and hybrid techniques; energy harvesting circuits and systems; circuits for lighting.

**RF CIRCUITS and WIRELESS SYSTEMS:** Building blocks and complete solutions at RF, mm-Wave and THz frequencies for receivers, transmitters, frequency synthesizers, transceivers, SoCs and SiPs; Innovative circuit-level and system architecture solutions for established wireless standards and future systems or applications, including wireless sensing, radar and localization.

**TECHNOLOGY DIRECTIONS:** Emerging IC and system solutions for: biomedical applications, sensor interfaces, analog signal processing, power management, computation, data storage, security, and communication; non-silicon, carbon, organic, metal-oxide-, compound, wide-bandgap-semiconductor. and nano electronics circuits; flexible, large-area, stretchable, and printable electronics; 3D integration; spintronics; quantum, optical, new-device, and non-transistor-based circuits.

**WIRELINER:** Receivers/transmitters/transceivers for wireline systems, including backplane transceivers, optical links, chip-to-chip communications, 2.5/3D interconnect, copper cable links, and equalizing on-chip links; exploratory I/O circuits for advancing data rates, power efficiency, and equalization; building blocks for wireline transceivers (such as AGCs, analog and ADC/DAC-based front ends, equalizers, clock generation and distribution circuits including PLLs, line drivers, and hybrids).

**NEW FIRM DEADLINE FOR REGISTERING INTENT TO SUBMIT:** Thursday, September 7, 2017, 3:00 PM ET

**FIRM DEADLINE FOR PAPER SUBMISSION:** Monday, September 11, 2017, 3:00 PM ET

Authors should submit 2 items for review: 1) An informative and quantitative Abstract; 2) A Draft Manuscript for the Digest of Technical Papers. Also, read the Pre-Publication Guidelines (summarized below) carefully!

The submission Website will be available starting July 1, 2017. You may consult the Website for instructions at any time after this date.

To submit a paper, go to: <http://submissions.mirasmart.com/ISSCC2018> to upload the manuscript and provide the requested additional information. Authors must register their intent to submit on the website by September 7, 2017, this will require upload of an abstract and completion of a submission questionnaire. The full manuscript must be submitted by September 11, 2017. During the submission process you will be asked for a suggested subject area, however this subject area may be changed by the ISSCC organization to streamline the review process.

A sample abstract and draft Digest paper can be found at the ISSCC Website (single-column double-spaced format is required for the paper-review process).

## PUBLICATIONS

The latest in SSCS Flagship Publications...

**IEEE Journal of Solid-State**



# Circuits

## Vol. 52, Issue 7, July 2017

[Insights Into Phase-Noise Scaling in Switch-Coupled Multi-Core LC VCOs for E-Band Adaptive Modulation Links](#)  
Lorenzo Iotti ; Andrea Mazzanti ; Francesco Svelto

[A Recursive Switched-Capacitor House-of-Cards Power Amplifier](#)  
Loai G. Salem ; James F. Buckwalter ; Patrick P. Mercier

[A 2-11 GHz 7-Bit High-Linearity Phase Rotator Based on Wideband Injection-Locking Multi-Phase Generation for High-Speed Serial Links in 28-nm CMOS FDSOI](#)  
Enrico Monaco ; Gabriele Anzalone ; Guido Albasini ; Simone Erba ; Matteo Bassi ; Andrea Mazzanti

[Low-Power Wideband Analog Channelization Filter Bank Using Passive Polyphase-FFT Techniques](#)  
Hundo Shin ; Ramesh Harjani

[A 65-nm CMOS Wideband TDD Front-End With Integrated T/R Switching via PA Re-Use](#)  
Xiao Xiao ; Amanda Pratt ; Bonjern Yang ; Angie Wang ; Ali M. Niknejad ; Elad Alon ; Borivoje Nikolić

[A 0.5-16.3 Gbps Multi-Standard Serial Transceiver With 219 mW/Channel in 16-nm FinFET](#)  
Marc Erett ; James Hudner ; Declan Carey ; Ronan Casey ; Kevin Geary ; Kay Hearne ; Pedro Neto ; Thomas Mallard ; Vikas Sooden ; Mark Smyth ; Yohan Frans ; Jay Im ; Parag Upadhyaya ; Wenfeng Zhang ; Winson Lin ; Bruce Xu ; Ken Chang

[An 802.11a/b/g/n/ac WLAN Transceiver for 2 \$\times\$ 2 MIMO and Simultaneous Dual-Band Operation With +29 dBm P<sub>sat</sub> Integrated Power Amplifiers](#)  
Shing Tak Yan ; Lu Ye ; Raghavendra Kulkarni ; Edward Myers ; Hsieh-Chih Shih ; Hongbing Wu ; Shadi Saberi ; Darshan Kadia ; Dicle Ozis ; Lei Zhou ; Eric Middleton ; Joo Leong Tham

[MIMO Switched-Capacitor DC-DC Converters Using Only Parasitic Capacitances Through Scalable Parasitic Charge Redistribution](#)  
Nicolas Butzen ; Michiel S. J. Steyaert

[An All-Digital Fully Integrated Inductive Buck Regulator With A 250-MHz Multi-Sampled Compensator and a Lightweight Auto-Tuner in 130-nm CMOS](#)  
Monodeep Kar ; Arvind Singh ; Anand Rajan ; Vivek De ; Saibal Mukhopadhyay

[Digital 2-/3-Phase Switched-Capacitor Converter With Ripple Reduction and Efficiency Improvement](#)  
Junmin Jiang ; Wing-Hung Ki ; Yan Lu

[An Energy-Scalable Accelerator for Blind Image Deblurring](#)  
Priyanka Raina ; Mehul Tikekar ; Anantha P. Chandrakasan

[A RISC-V Processor SoC With Integrated Power Management at Sub-microsecond Timescales in 28 nm FD-SOI](#)  
Ben Keller ; Martin Cochet ; Brian Zimmer ; Jaehwa Kwak ; Alberto Puggelli ; Yunsup Lee ; Milovan Blagojević ; Stevo Bailey ; Pi-Feng Chiu ; Palmer Dabbelt ; Colin Schmidt ; Elad Alon ; Krste Asanović ; Borivoje Nikolić

[A Hybrid Multi-Path CMOS Magnetic Sensor With 76 ppm/°C Sensitivity Drift and Discrete-Time Ripple Reduction Loops](#)  
Junfeng Jiang ; Kofi A. A. Makinwa

[A 3.5-6.8-GHz Wide-Bandwidth DTC-Assisted Fractional-N All-Digital PLL With a MASH 1<sup>st</sup> 1 \$\frac{1}{2}\$  -TDC for Low In-Band Phase Noise](#)  
Ying Wu ; Mina Shahmohammadi ; Yue Chen ; Ping Lu ; Robert Bogdan Staszewski

[A Differential Transmission Gate Design Flow for Minimum Energy Sub-10-pJ/Cycle ARM Cortex-M0 MCUs](#)  
Hans Reyserhove ; Wim Dehaene

[A Compiled 9-bit 20-MS/s 3.5-fJ/conv.step SAR ADC in 28-nm FDSOI for Bluetooth Low Energy Receivers](#)  
Carsten Wulff ; Trond Ytterdal

[A 0.065-mm<sup>2</sup> 19.8-mW Single-Channel Calibration-Free 12-b 600-MS/s ADC in 28-nm UTBB FD-SOI Using FBB](#)

Ashish Kumar ; Chandrajit Debnath ; Pratap Narayan Singh ; Vivek Bhatia ; Shivani Chaudhary ; Vigyan Jain ; Stephane Le Tual ; Rakesh Malik

[A 174.3-dB FoM VCO-Based CT  \$\hat{\Gamma}\$  Modulator With a Fully-Digital Phase Extended Quantizer and Tri-Level Resistor DAC in 130-nm CMOS](#)

Shaolan Li ; Abhishek Mukherjee ; Nan Sun

[A 82-nW Chaotic Map True Random Number Generator Based on a Sub-Ranging SAR ADC](#)

Minseo Kim ; Unsoo Ha ; Kyuho Jason Lee ; Yongsu Lee ; Hoi-Jun Yoo

[An Energy-Efficient Hybrid SAR-VCO  \$\hat{\Gamma}\$  Capacitance-to-Digital Converter in 40-nm CMOS](#)

Arindam Sanyal ; Nan Sun

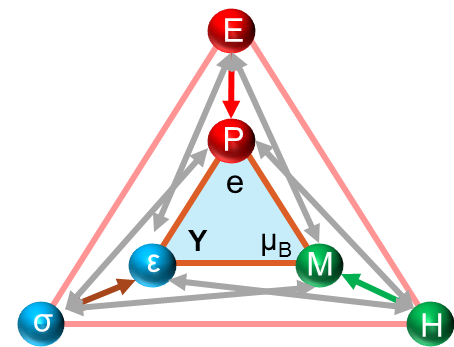
[A 63-dB DR 22.5-MHz 21.5-dBm IIP3 Fourth-Order FLFB Analog Filter](#)

Marcello De Matteis ; Alessandra Pipino ; Federica Resta ; Alessandro Pezzotta ; Stefano D'Amico ; Andrea Baschirotto

## IEEE Journal on Exploratory Solid-State Computational Devices and Circuits

### January to June 2017 Highlights

In the first half of 2017, the Journal on Exploratory Solid-State Computational Devices and Circuits had top five of the papers published which already appear in the top 8 of the journal's most accessed papers. These papers include:



[An Energy-Efficient Digital ReRAM-Crossbar-Based CNN With Bitwise Parallelism](#)

Leibin Ni ; Zichuan Liu ; Hao Yu ; Rajiv V. Joshi

[Nonboolean Pattern Recognition Using Chains of Coupled CMOS Oscillators as Discriminant Circuits](#)

Vahnood Pourahmad ; Sasikanth Manipatruni ; Dmitri Nikonov ; Ian Young ; Ehsan Afshari

[Compact Modeling of Distributed Effects in 2-D Vertical Tunnel FETs and Their Impact on DC and RF Performances](#)

Jie Min ; Peter M. Asbeck

[Nonvolatile Spintronic Memory Array Performance Benchmarking Based on Three-Terminal Memory Cell](#)

Chenyun Pan ; Azad Naeemi

[CoMET: Composite-Input Magnetoelectric- Based Logic Technology](#)

Meghna G. Mankalale ; Zhaoxin Liang ; Zhengyang Zhao ; Chris H. Kim ; Jian-Ping Wang ; Sachin S. Sapatnekar

JxCDC papers listed in order of popularity can be found online [HERE](#).

For paper submission details, click [HERE](#).

## NEWS

**Upcoming - Women in Circuits Bay Area**

## Networking Luncheon

### Find a Mentor, Be a Mentor

Join the first annual Women in Circuits Bay Area Networking Luncheon. Build and sustain a community among women in circuits. Meet and network with female luminaries in engineering.



**DATE:** Friday, July 14

**TIME:** 12 - 3:00 PM (PDT)

**LOCATION:** Il Fornaio Palo Alto, 520 Cowper Street, Palo Alto, CA 94301 (<https://www.ilfornaio.com/paloalto>)

**COST:** \$20 for SSCS Members, \$25 for IEEE Members, \$30 for Non-members

**[TO PURCHASE YOUR TICKET, PLEASE CLICK HERE!](#)**

### Agenda

12:00 PM Doors Open

12:15 PM Opening speech by Yildiz Sinangil

12:20 PM Women in Circuits Program Overview by Alice Wang

12:40 PM Mentoring Roundtable

2:30 PM Concluding Remarks by Alice Wang



## Do you Qualify for IEEE Senior Member Grade?

Senior Member is the highest grade for which IEEE members can apply. IEEE members can self-nominate or be nominated for Senior Member grade.

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For more information on IEEE Senior Member Grade, please [click here](#). If you have any questions or concerns, or need assistance obtaining references, email [sscs-membership@ieee.org](mailto:sscs-membership@ieee.org).

The next Senior Member review panel is in August. Become a Senior Member now!

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**The IEEE Design & Test Magazine is Now Available in Digital Version for Subscribers!**





Starting in 2017, the IEEE Design & Test Magazine is available in digital version for subscribers at no extra cost.

For fast browsing, subscribers also have access to the PDF version of the entire issue. The magazine is available through IEEE Xplore and the print version.

Not a subscriber? The complete electronic, digital, and print subscription is \$54 USD a year for IEEE members of select societies (including the Solid-State Circuits Society).

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## New offering for SSCS members



In an effort to increase member benefits, SSCS has created the SSCS Resource Center. This informational hub will house technical information such as past webinar videos and slides, ISSCC tutorials and short courses, and more.

### Top 5 Downloaded Products on the SSCS Resource Center:

- 1). [ISSCC 2015 Tutorial: High Speed Current Steering DACs](#), Presented by Jan Mulder
- 2). [Webinar: Trends in Broadband Converters](#), Presented by David H. Robertson
- 3). [ISSCC 2006 Short Course: Pipelined A/D Converters](#), Presented by Bang-Sup Song
- 4). [Webinar: Enabling and Exploiting Machine Learning in Ultra-low-power Devices](#), Presented by Naveen Verma
- 5). [Webinar: The X Files, Sheerluck Ohms and the 33dB Solution](#), Presented by Paul Brokaw

[Click here to visit the SSCS Resource Center.](#)

**SSCS Members Can Join Sister Societies for Just \$5  
Use Code SSCXCAS2017 or SSCXEDS2017**

If you have not renewed your SSCS membership for 2017, you can enter the promotion code SSCXCAS2017 at checkout to join the Circuits and Systems Society (CAS) for \$5 or SSCXEDS2017 to join the Electron Devices Society (EDS) for \$5.

If you have already renewed for 2017, [click here](#) for more details about the discounted CAS membership and [click here](#) for more details about the discounted EDS membership.

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## Earn Continuing Education Hours

Have you attended an SSCS webinar? Attendees of upcoming and past webinars have the opportunity to earn professional development hours. Certificates of completion are offered to participants who view a webinar. A certificate of completion confirms one hour of professional development. After you attend the webinar, you may request a certificate of completion by completing the form [HERE](#).

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## Seeking News

Please send any chapter news or happenings (Distinguished Lecturer visits, events hosted by your SSCS chapter, awards received by members, etc) to Abira Sengupta, SSCS Magazine News Editor, for inclusion in an upcoming issue of the magazine. Please email - [Abira.Sengupta@ieee.org](mailto:Abira.Sengupta@ieee.org). We look forward to receiving your news articles!

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For more chapter news, [check out](#) the **Spring 2017 issue of the Solid-State Circuits Magazine**.

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## FEEDBACK

Let us know what you think! Please [email us](#) to send us your comments about the newsletter, what you would like to see included each month, or any other comments.

[CLICK HERE TO VISIT OUR WEBSITE](#)

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