Seven can't miss highlights at ISSCC

Don Scansen - February 16, 2011

The theme of this year's International Solid-State Circuits Conference (ISSCC) is "Electronics for Healthy Living." The semiconductor industry is clearly looking to chart some new territory that can provide some improved revenue growth. Next week's ISSCC (Feb. 20-24) follows on the heels of an EE Times special edition devoted to medical electronics.

More recently, my frequent collaborator, Paul Boldt provided his insights into the opportunities for chip companies in the current generation of medical appliances.

Despite the enthusiasm for opportunities in biomedical, it would be hard to build a conference the size of ISSCC solely on that subject. But the theme does allow for biasing the presentations in directions that could prove important to medical electronics in the future. I'm thinking mostly about low-power and low voltage (ULV, as touted on the conference brochure). In addition to the sessions like Low Power Wireless (26) and Sensors & Energy Harvesting (6), there is a Sunday Forum, Ultra-Low Voltage VLSIs for Energy Efficient Systems (F2). There are tutorials picking up the theme including Ultra Low-Power and Low-Voltage Digital-Circuit Design Techniques (T3) as well as a tutorial appearing as one of my conference picks below, Harold Pilo's embedded memory tutorial (T2).

There is also a session Sunday evening (Feb. 20) on wireless sensors, where there is an obvious need to create low power devices, and the second speaker looks at "Ultra-low Power Design for WSN."

The ISSCC committee is proud of a new feature this year, the technology roundtable plenaries. The first follows quickly after the three plenary talks. Beyond the horizon: The next 10x Reduction in Power—Challenges and Solutions rounds out the theme. This panels includes some true industrial and academic heavyweights like Mark Horowitz, Jack Sun, Dan Dobberpuhl, Kiyoo Itoh, and Asad Abidi.

With that quick view of some of the highlights, it's pretty obvious ISSCC is a real working conference. It's good value if you can keep up the pace of roundtables starting at 8 a.m. and evening panels starting at 8 p.m. This year, there is something new on Tuesday evening as well—Industrial Demo Sessions. I'm sure many attendees will look forward to getting back to their regular jobs to catch their breath.

To help avoid overload, here are my selections of what I would like to attend at the conference. If you are paying registration plus travel to get there (or even it's just your boss signing off on it), you might
want to hit a few more sessions. But I hope the condensed list below will help avoid information overload and burnout. At least you can maximize your networking or other social interactions, which are still the most important reasons to get to these events in person.

1. **Tutorial #2 - Embedded Memories for SoC: Overview of Design, Test, and Applications and Challenges in the Nano-Scale CMOS**
2. **A 3µw Wirelessly Powered CMOS Glucose Sensor for an Active Contact Lens**
3. **Session 23 - Image Sensors**
4. **A 130µa Wake-up Receiver Soc in 0.13µm CMOS for Reducing Standby Power of an Electric Appliance Controlled by an Infrared Remote Controller**
5. **Session 13 - Analog Techniques**
6. **Session 15 - High-Performance SoCs & Components**
7. **A Telemetric Stress-Mapping CMOS Chip with 24 FET-Based Stress Sensors for Smart Orthodontic Brackets**

**Tutorial #2 - Embedded Memories for SoC: Overview of Design, Test, and Applications and Challenges in the Nano-Scale CMOS**

The embedded memories tutorial is one of nine educational offerings on Sunday getting serious engineers into the groove before the main conference kicks off the next day. I took Harold Pilo's excellent SRAM tech course at IEDM a few years ago and it was well worth it. Despite the more generic title, I expect this tutorial to concentrate quite a bit of material on SRAM concepts.

By the way, did anyone else notice a strong IBM presence at ISSCC this year? Perhaps it is appropriate considering IBM's celebration of its centennial in 2011. (Hello PR department. Was this intentional?) There are certainly not 100 mentions of IBM in the conference material, but if you continue to follow the web page, IBM promises to reveal 100 milestones from their past hundred years at **100 Icons of Progress**. I have not compared the number of papers directly to previous conferences, but my completely unsystematic and unscientific analysis suggests a large contribution from Big Blue.

**A 3µw Wirelessly Powered CMOS Glucose Sensor for an Active Contact Lens**
This paper from University of Washington collaborators gets right to the heart (more like pancreas) of the theme of ISSCC 2011. I suppose it should since it appears in the microcosm session for the conference, *Technologies for Health* (Session 2, Monday). I'm ready to take the heat for sounding like this is just a convenient way to announce the birth of our third daughter, Jane, born last month, but my wife had gestational diabetes for the second time, so we are interested in any technology that can improve that experience.

Conventional glucose monitoring is tiresome at best and the constant finger pricking is certainly not fun. For those facing a lifetime with diabetes, this adds insult to the serious side of the disease. Real time monitoring would certainly offer real health benefits as well. However, the cynics among us may wonder if the cash cow of consumables for glucose monitoring might impede product development of the active contact lens monitor.

**Session 23 - Image Sensors**

From electronics for the eye, we turn to electronic eyes.

I will make use of some creative accounting in an attempt to keep the list close to the five my editor requested. Even though last year's conference theme was sensing and a well known imaging guru served as the technical chair for ISSCC, it would be tough not to pick this session. If you have any doubt that Session 23 on Wednesday offers something for everyone, the presentations cover the
spectrum from the largest to the smallest imaging arrays. First, consider the all-seeing Eye of Sauron presented by Yamashita et al from Canon. A 300mm Wafer-Size CMOS Image Sensor with In-Pixel Voltage-Gain Amplifier and Column-Level Differential Readout Circuitry. I attended the International Image Sensor Workshop in 2007 where Canon presented a similarly monstrous imager that could image an entire parking lot from over 200 meters atop a building while offering digital zoom capable of reading a license plate. The Canon wafer size imager presented at ISSCC 2011 is built for a different purpose with high sensitivity, variable pixel gain and 100 frames-per-second global shutter, but you begin to get the point that Canon is really good at building really big sensors.

On the other end of the spectrum, Johansson and colleagues from Aptina sites scattered around the globe including Norway, the UK, California and Oregon will present their tiny sensor in A 1/13-inch 30fps VGA SoC CMOS Image Sensor with Shared Reset and Transfer-Gate Pixel Control. This VGA array is only 1.77mm², and the pixel sharing scheme claims to improve low-light performance.

A 130μa Wake-up Receiver Soc in 0.13μm CMOS for Reducing Standby Power of an Electric Appliance Controlled by an Infrared Remote Controller

This paper by Ishihara and colleagues from Toshiba appears in Session 12 – Design in Emerging Technologies on Tuesday. The title and abstract sound remarkably low tech compared with other papers in this session, but it sounds a lot more like a real product and one that consumers can understand and perhaps even value. A more mainstream technology amongst many esoteric ones used to create a useful product make this contribution stand out.

Session 13 - Analog Techniques

I'm not an analog designer, but there are two papers in this session that will appeal to most EEs. 13.1 and 13.2 both describe improvements to LED drive circuitry. Like pick number four, these two papers are not quite aligned with the conference theme, but I intend to read both as soon as they are available. A Simple LED Lamp Driver IC with Intelligent Power-Factor Correction from Fairchild, Korea, and A 1.2A Buck-Boost LED Driver with 13% Efficiency Improvement Using Error-averaged SenseFET-Based Current Sensing from Oregon State University and National Semiconductor are worth checking out on Tuesday afternoon.

Session 15 - High-Performance SoCs & Components
Intel MPU papers always seem to draw a crowd, and I expect this to be a popular session because Intel and AMD will both present papers on integrated CPU/GPU ICs. Intel presents their Sandy Bridge architecture in *A Fully Integrated Multi-CPU, GPU and Memory Controller 32nm Processor*. AMD presents their Fusion brand technology with the Zacate chip in *A Low-Power Integrated x86-64 and Graphics Processor for Mobile Computing Devices*.

**A Telemetric Stress-Mapping CMOS Chip with 24 FET-Based Stress Sensors for Smart Orthodontic Brackets**

Kuhl and a team including the University of Freiburg and HSG-IMIT presents early Monday afternoon. If you've worn braces before, you may have wished the orthodontist had better feedback than the terror in your eyes while he was cranking on the wires. I like this paper because it obviously fits the theme of healthy living and includes not only the measurement side but the telemetry that will be a key feature in future medical electronics.

Themes are a convenient marketing approach, but it is really the less glitzy sounding underlying technology that sets the tone for these conferences. The low power, low voltage underpinnings of this year's ISSCC will be just as comfortable with portable computing, green technology, or any number of other themes we are bound to see in the years ahead. Or just look back to System Integration for Life and Style (2008), or Multimedia for the Mobile World (2006).