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Interview: Silicon Labs CEO Tyson Tuttle Discusses The Mixed-Signal IC Business

Lou Frenzel | *Electronic Design*

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Q & A with Tyson Tuttle CEO of silicon Labs.



Tyson Tuttle

Silicon Labs is one of several very successful mixed-signal IC companies. Combining both linear and digital circuits on a chip is an art and a science. Silicon Labs has mastered this challenge to create a unique mix of widely used communications products like tuners, voltage-controlled oscillators (VCOs), counters and timers, and RF transceivers. CEO Tyson Tuttle discusses the markets, business, and products.

ED: For those not familiar with Silicon Labs, briefly explain the company's products and capabilities.

TT: Silicon Labs is a mixed-signal IC company with approximately \$600 million in annual revenues and 1100 employees worldwide. Founded in 1996 and headquartered in Austin, Texas, we have offices and operations throughout the United States, Europe, and Asia. Leveraging our mixed-signal and RF CMOS technology foundation, we provide a wide range of CMOS-based IC solutions for the communications, industrial, and consumer electronics markets, and we are one of the most diversified semiconductor companies for our size. Silicon Labs has three primary businesses encompassing broad-based, broadcast, and access products including 8-bit and ARM-based microcontrollers, wireless ICs, audio and video tuners, timing devices (clocks and oscillators), environmental and proximity sensors, digital isolators, subscriber line interface circuits, and modems. Our broad-based products – MCUs, wireless ICs, timing devices, sensors and isolators – represent not only our largest business but also the future of Silicon Labs, offering the greatest opportunity to achieve high-quality growth.

ED: What are some of your core intellectual property (IP) assets?

TT: Our intellectual property is the lifeblood of the company and the source of our innovation. We have more than 1300 patents issued and pending in core areas such as RF in CMOS, low-IF digital architecture, mixed-signal technology, precision analog, ultra-low-power MCU design, low-jitter and any-frequency clocks and oscillators, and CMEMS technology (a new patented architecture and process integrating a MEMS structure directly on top of a CMOS die, enabling monolithic “CMOS+ MEMS” devices).

ED: What is your best-selling product or product line?

TT: Our silicon TV tuner is one of the most successful, fastest-ramping products in Silicon Labs' history. After launching our first TV tuner product in 2009, we reached a 100

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million-unit shipment milestone in mid-2012. A year later, we've shipped more than 200 million units, demonstrating an exponential market momentum. Solidifying our number-one position in the video tuner market, we are now supplying silicon TV tuners in high volumes to nine out of the world's top 10 TV makers.

Manufactured in standard CMOS process technology, our silicon TV tuners were the first technology to fully displace traditional tuner modules in flat-panel TVs and have been adopted by virtually all of the name-brand TV makers. Our patented TV tuners represent a disruptive breakthrough that enables TV makers to improve picture quality and channel reception while reducing system cost and complexity. Our latest Si21x7 TV tuner family represents the state of the art in silicon tuners based on five generations of patented architectural enhancements. The commercial success of our TV tuners speaks to the mixed-signal and RF innovations we've delivered for more than a decade.

ED: What trends are driving your current development efforts?

TT: Like all semiconductor suppliers, we focus on delivering complete solutions—silicon, software, tools and reference designs—that enable our customers to reduce their system cost, component count, form factors, power consumption, and time-to-market. These market drivers are a constant in our industry, and we must forever race along this “faster, smaller, cheaper” treadmill to remain competitive and help our customers succeed in their end markets.

Two significant industry trends are driving much of our broad-based product development efforts: the global demand for smart energy technology and the rise of the Internet of Things. These two trends are closely related. For example, smart energy solutions such as smart meters, smart thermostats, and other home automation systems rely on connected devices to tap the power of the Internet and capture, analyze, and communicate data in ways that help end users reduce energy consumption.

The growth of the IoT market, coupled with continuing deployment of Smart Grid and smart energy infrastructure, is also driving strong demand for energy-efficient processing, standards-based wireless connectivity, and a variety of sensors to enable intelligent connected devices in which ultra-low-power capabilities are increasingly important. There are already more Internet-connected devices on the planet than people, and industry experts predict that the number of connected devices for the IoT will top 15 billion nodes by 2015 and reach 50 billion nodes by 2020. Many of those nodes will require energy-friendly ARM-based MCUs and wireless systems-on-chip (SoCs) designed to achieve current consumption as low as 100 μ A per megahertz.

The IoT represents our largest opportunity, and one that dwarfs many past markets. PCs were the first 100 million-unit-per-year market. Then handsets became the first 1 billion-unit market. And now the IoT will be the first 10 billion-unit-per-year market. The IoT is also a huge and diverse market that requires mixed-signal technology, the utmost in energy efficiency, and a host of broad-based products.

To augment our existing extensive mixed-signal portfolio, we acquired Ember in mid-2012 to obtain the industry's best ZigBee hardware and software solutions for mesh networking, and the recent Energy Micro acquisition brings us the world's most energy-friendly ARM-based microcontrollers, along with easy-to-use, power-aware software tools that are the best of their kind in the embedded industry. We now have all the pieces in place to deliver complete, ultra-low-energy mixed-signal solutions for connected devices in the “last inch” of the IoT. We have made our investments, and at this point, it's all about execution.

ED: What are your major markets and who are your typical customers?

TT: It's just as important to decide which markets we will not pursue as it is which markets we will address. For example, we exited the PC market in the early 2000s when it became commoditized, and then we exited the handset market in the mid-2000s when the investments necessary to compete in that market became unsustainable. In contrast, communications, consumer, and industrial are large and diverse markets that are well served by our broad-based portfolios and mixed-signal technologies. Over the past 10 years, we have transformed the company into largely a broad-based mixed-signal IC supplier. We are now achieving record revenues with our broad-based products, and it is the best way to grow.

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The broad-based market offers hundreds of channels of market opportunities. In the MCU arena alone, there are about 150,000 possible customers, and we are currently serving about 10,000 to 15,000 of those customers with our MCU portfolio. Our customers in the broad-based market range from large multi-billion-dollar OEMs that buy millions of units at a time to small manufacturers and design houses buying in the tens of thousands of units.

ED: Can you give us a hint at what might be some forthcoming products?

TT: Keep an eye on new chip products, tools, and software coming out of our MCU and wireless business, which has been significantly reinforced and energized by the Energy Micro and Ember acquisitions. In the near future, we will be shipping low-energy ARM Cortex-M0+ MCUs in volume to large customers. Expect to see even more energy-friendly ARM-based MCUs, wireless SoCs, software solutions, and reference designs coming to market in 2014. In addition to broadening our ZigBee SoC family with higher-performance options, we'll be adding Bluetooth LE solutions to our low-power wireless portfolio.

In June of this year, we introduced our first MEMS-based oscillator products based on CMEMS technology. CMEMS (a contraction of CMOS + MEMS) is the first-time fabrication technology of its kind that enables direct post-processing of MEMS layers on top of advanced CMOS technology as a single monolithic die. CMEMS technology leverages the economies of scale afforded by standard, high-volume semiconductor manufacturing processes to create semiconductor products that enable smaller form factors, better performance, lower cost, and greater scalability.

Our new CMEMS oscillators are poised to create a positive disruption in the frequency-control industry by combining the advantages of MEMS-based solutions with many of the best characteristics of quartz oscillators. Possibilities for additional CMEMS-based products are virtually unlimited, providing opportunities to address new and emerging markets with higher performance timing solutions, a wide range of frequencies and power budgets, and higher levels of single-chip integration. Stay tuned for new and exciting CMEMS products to appear in the market in 2014 and beyond.

ED: How is your acquisition of Ember working out? How does the wireless future look?

TT: Ember was an excellent, well-timed acquisition. The timing was right to expand our wireless portfolio to include a standards-based low-power wireless mesh networking solution. While Ember had excellent 2.4-GHz ARM-based SoC devices, they were fundamentally a software company with industry-leading ZigBee software stacks. So we gained a very strong ZigBee development team, and the Ember ZigBee software stacks and development tools are truly best in class. Since the acquisition, we have made great progress in integrating the team and technology into our embedded wireless platform, and we now offer wireless mesh networking solutions that are second to none. Our wireless product sales remain strong, especially in IoT applications. The growth opportunities in the low-power wireless mesh networking market are tremendous, and I am confident that ZigBee technology ultimately will win in that segment of the wireless market.

ED: Tell us more about the recent acquisition of Energy Micro. What was the strategy behind the deal?

TT: We have been following Energy Micro's rapid progress in the embedded market since the company was founded by Geir F  rre (CEO of Energy Micro) and his team in 2007. Our interest in Energy Micro deepened in 2009 when they introduced their energy-friendly EFM32 Gecko MCUs. Even then, I realized that Energy Micro's focus on energy-friendly solutions represented the best opportunity in terms of where our mixed-signal technology could have the most impact on the embedded world. We started discussions with Energy Micro in early 2013 about how to compete effectively against much larger MCU suppliers. Both of our companies wanted to participate in the 32-bit MCU market in a more meaningful and disruptive way and take share away from these larger competitors. As we started our discussions, we realized that we had complementary cultures and skill sets that made our two companies a unique fit. It became clear that it made good sense to unite our companies and combine our embedded portfolios and

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technologies to leapfrog the competition in delivering best-in-class energy-friendly ARM-based solutions.

The acquisition of Energy Micro accelerates Silicon Labs' growth opportunities and positions us as the foremost innovator in energy-friendly embedded solutions. The acquisition significantly expands our 32-bit MCU portfolio by adding nearly 250 ARM-based EFM32 Gecko MCU products with cores scaling from ARM Cortex-M0+ to Cortex-M4. In addition, the acquisition augments our ZigBee solutions with additional low-power wireless protocols such as Bluetooth LE. We plan to develop new generations of ARM-based solutions incorporating the best energy-friendly and embedded wireless technologies from both companies. Ultimately, we view the acquisition as a good fit not only in terms of technology, but culturally as well. We have extremely passionate innovators in both companies, and I cannot wait to see what we can do when we put them together.

ED: What are your thoughts about engineering education today?

TT: The electrical engineering profession has so many areas of specialization that I urge engineering students to get a master's degree or higher. Education beyond a bachelor's degree provides engineers with a depth of knowledge that properly prepares them for the specific field they want to practice after graduation. A combination of a BSEE and an MBA can also be very powerful for engineers who have may have career plans to move beyond design and into product and business group management.

ED: Are you finding enough engineers and other technical professional to fill your needs?

TT: We hire only the best and brightest talent, mentor them, and then turn them loose on challenging design problems. To that end, we have a very active new college graduate (NCG) program. We engage year-round with the top engineering schools in the nation and recruit numerous high-caliber engineering graduates each summer. In fact, about 50% of our new hires are new college graduates. We also have an active mentoring program to help integrate our NCG hires into our engineering teams and our unique Silicon Labs culture.

ED: Do you have any advice for engineers who are anxious to improve or move up?

TT: At Silicon Labs, our engineers are never "stuck" in particular roles. We have a multi-disciplinary design culture that encourages out-of-the-box thinking and unconventional solutions to problems. To help our designers broaden their engineering horizons, we frequently rotate teams, projects, and design approaches. This organizational flexibility enables our engineers to expand their analog, digital, and signal processing expertise across multiple product categories and markets.



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Tyson Tuttle is chief executive officer of Silicon Labs. He joined Silicon Labs in 1997 and helped design the company's first product, a silicon DAA, that subsequently achieved market share leadership in PC modems and allowed the company to go public in 2000. He led the marketing effort behind the company's first RF transceiver products for mobile handsets. He also spearheaded the development and market penetration strategy of the company's successful radio and TV tuner ICs, creating the broadcast business that today represents about one-third of the company. He led the broadcast product lines until 2010 when the R&D team was consolidated under his leadership as chief technology officer. He then took over as chief operating officer in 2011 and was responsible for managing all of the company's business units and R&D. He became the CEO in 2012. Prior to joining Silicon Labs, he held senior design engineering positions at Crystal Semiconductor/Cirrus Logic and Broadcom Corp. He holds an MS in electrical engineering from UCLA and a BS in electrical engineering from Johns Hopkins University. He has 61 patents issued or pending in the areas of RF and mixed-signal IC design.

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