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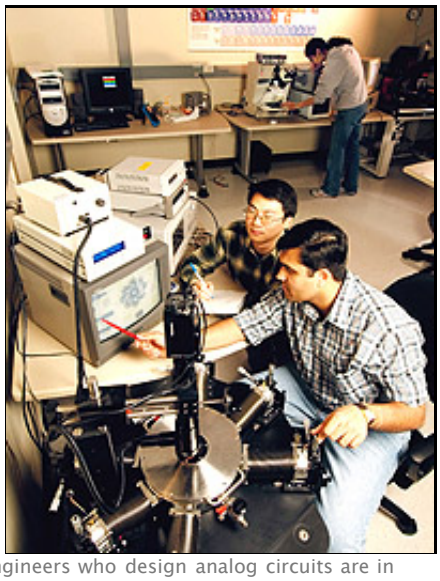
Georgia Tech's Analog Expertise in Great Demand

Analog integrated circuits are in high demand for their advantages

Atlanta (April 30, 2006) — Researchers who study analog chips are in high demand today. Interest in these efficient and adaptable integrated circuits (ICs) is surging because of their advantages over conventional digital chips.

In today's electronics world analog chips perform a vital role, taking real-world information such as audio, video and temperature and converting it to the digital form that computers use.

But many researchers say analog's advantages go much farther, extending to the areas of power consumption, size, and heat generation that are critical to today's handheld devices.



Engineers who design analog circuits are in demand as electronic products increasingly use these efficient and adaptable chips . Here graduate students pursue research at the Georgia Electronic Design Center. (Georgia Tech Photo: Gary Meek)
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Colleges and universities that train analog engineers are few and elite. The *San Jose Mercury News*, a Silicon Valley newspaper, recently published an article focusing on Georgia Tech, the Massachusetts Institute of Technology, Stanford University and the University of California-Berkeley as top centers of advanced analog education.

"The world analog market is topping $32 billion a year and growing," said Joy Laskar, director of the Georgia Electronic Design Center (GEDC), a Georgia Tech center that specializes in research and design of "mixed-signal"—analog and digital—applications. "Our 41 industry partners keep a careful eye on both our research and our students."

The technology business world of today is excited about analog ICs, says Young Kim, vice president of business development for GTronix Inc., an analog chip design company located in Fremont, Calif., and Atlanta, Ga., that has Georgia Tech roots.

"We were one of the rare cases where a top-tier venture capital firm funded us based on purely the potential of the technology," he said. "And that is because of the quality and potential of the technology that was researched within GEDC."

GTronix has closed on a second round of funding from Menlo Ventures, a prominent Silicon Valley venture capital firm with $3.9 billion under management. The new capital infusion was in the "low double-digit millions," Kim said. Deliveries of initial products aimed at the audio-applications market are probable in the 2006 second quarter, he adds.

Other analog-oriented companies to come out of Georgia Tech include RF Solutions of Norcross, Ga., acquired in 2003 by New Jersey-based Anadigics Inc., and Quellan Inc., based in Santa Clara, Calif.; Atlanta, and Tokyo.

Analog's most important virtue may be its capacity to do many tasks that digital chips can – and do them better, says Paul Hasler, an associate professor in the Georgia Tech School of Electrical and Computer Engineering (ECE) and an analog research specialist at GEDC. Hasler, who is GTronix's chief science officer, runs the Cooperative Analog/Digital Signal Processing Lab within GEDC.

"Analog's biggest advantage is that it burns a lot less power," said Hasler, who is also director of the Georgia Tech Analog Consortium, a research group within GEDC. "It's a factor of a thousand or so when it's done right."

While a typical digital circuit operating at one watt might run an hour or two with a given battery, he explains, the equivalent analog circuit might last more than a month.

"When you're looking at an hour versus a month timeframe in terms of your battery life, that's pretty impressive," he said.

Analog's other advantages include small size and low heat production, explains David V. Anderson, an ECE professor who works with Hasler at GEDC. That means analog circuits may be preferable for many tasks suited to future mobile devices, including speech recognition, audio processing, and image and

video processing.

Anderson has been researching reconfigurable analog and mixed-signal systems at GEDC. The traditional problem with analog systems, he says, is that users cannot simply just change function by changing what's in memory, as they can with a digital system. Instead, they have had to go through a costly and time-consuming design process.

GEDC researchers, he says, have developed analog chips that can be reconfigured on the fly to perform a variety of tasks.

"Now, it's essentially just a software change – and then this analog chip can do a different type of processing," Anderson said.

Prof. Joy Laskar is director of the Georgia Electronic Design Center.
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Such reconfigurable analog chips are not as adaptable as digital chips, but are more so than previous analog designs, he adds. In an audio analog chip, for example, one algorithm might clean up audio, and then switch to modem processing with a simple software change.

Analog's capabilities are familiar ground to National Semiconductor Corp. (NSC), a Santa Clara, Calif., company with $1.91 billion in sales in FY 2005. NSC's core area of expertise involves analog chips, principally RF and mixed-signal ICs.

"There's been an analog resurgence in the past five years," said Dennis Monticelli, chief technologist and fellow at NSC. "And it's back because of the user experience."

Digital technology, he explains, makes information easier to store, copy and transmit. But getting that information to human beings means going through the analog world—sound, video and power management depend on analog chips.

"When cell phone became digital," Monticelli pointed out, "the analog content of the cell phone actually increased, both to support digital chips with data conversion and power as well as to later add popular functions such as ring tones, MP3, and color displays."

Like a number of other companies, NSC keeps close ties to schools with strong analog-engineering programs. During the 1990s, Monticelli says, many universities backed off analog education and heavily emphasized digital.

"Georgia Tech was one of those schools that maintained a balance between digital and analog," Monticelli said. "We value our relationship there, and Joy Laskar as director of GEDC has helped the analog effort grow. We can choose the professors we would like to work with, and we get to work with some top students. We have a design center in Atlanta, and some Georgia Tech students wind up working there as well as in some of our other U.S. sites."

Gary May, who chairs Georgia Tech's School of Electrical and Computer Engineering, agrees that the combination of academic training and direct contact with industry helps put budding engineers on a solid career track.

"The Georgia Tech Analog Consortium has had a long history of success in preparing students for successful careers in industry," said May, who is Steve W. Chaddick School Chair. "Through GTAC's industrial fellowship program, graduate students can gain valuable work experience at leading electronics companies who are members of the Consortium. These internships can oftentimes lead to full-time employment."

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