Digital Technology Fuels The Analog Career Revolution

Digital technology advances are supplying analog designers with a linearly upward career path.

By John Edwards
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For Robert Dobkin, analog design is more than a career—it's a lifetime mission, something close to an obsession. "Analog designers are grown. They don't usually come out of college," observes Dobkin, vice president of engineering and chief technical officer at Linear Technology in Milpitas, Calif.

Often misunderstood and sometimes even derided by their digital design brethren, analog designers understand that in today's ones-and-zeros world it's easy to overlook the continuing vital role that's played by analog. Markets ranging from automotive technologies to communications systems to consumer appliances all wouldn't exist in their current forms without analog chips and circuits.

"It really still is an analog world in that our senses as humans are analog receptors," says Steven Macaluso, an analog design manager at Fairchild Semiconductor in South Portland, Maine. "We still need to convert the digital information that is available into something that our senses are capable of interpreting."

Jason Rhode, president and CEO of Cirrus Logic in Austin, Texas, agrees. "There may be an increasing number of digital solutions in an analog world, but the reality is that all the physical stimuli you'll encounter in your life are analog," Rhode says.

Since human evolution isn't likely to catch up with digital progress anytime soon, analog shows no signs of going away, and perhaps never will. "Analog pervades everything. It's always been there and it's always going to be there," declares Fred Wise, staffing director for National Semiconductor in Santa Clara, Calif. "Whatever new digital products or technologies come and go over the years, analog has always been an underlying foundation for the ability of all those products to succeed."

With analog systems still firmly embedded in the technosphere, and generally more difficult to develop than comparable digital circuits, finding qualified designers continues to be a major challenge for product manufacturers and other companies, even during hard economic times. But what's a headache for employers is nothing less than great news for analog designers, many of whom enjoy a level of security, recognition, and appreciation that other designers can only imagine.

"It's a good field to get into, if you have the natural talent, and very few leave it voluntarily," says David Robertson, product line director for Analog Devices' High-Speed Signal Processing Group, based in Norwood, Mass. "The point to remember is that if you're very good at what you do, you'll always be in demand."

Tied at the Hip

Wise dismisses the notion, popular with some digital types, that analog is an innovation backwater and that analog designers are mostly stuck working with dull, uninteresting technologies. He notes that analog and digital are, in fact, tied at the hip. "If someone is truly interested in analog design and has a good understanding of the field, the opportunities are really unlimited," he says.

Wise explains that companies in the analog world, by the nature of their technology, need to be very close to the people that use a wide range of leading-edge consumer and business technologies, such as mobile phones, media players, IP phone systems, and flatscreen TVs. "All of these things change and shape users' sensory perception, so analog designers have to get involved in all of these products keep up with new developments in these areas," he says.

For the past several years, analog designers have played a key role in one of the electronics industry's major technology battlefields—power. "With analog, we think about amplifiers, data converters, RF, and so on. But right now, the single largest analog segment is actually power management," Robertson says. "The drive for power and power efficiency is one of the things that's made power management such a growth area."

Macaluso says he feels continuous pressure to provide the best possible power characteristics in his designs. "Every handheld portable device you have is powered by a battery, and you want to get as much life out of this as you can before you need to charge it," he explains. "So your goal is to keep the power consumption of whatever chips Fairchild puts in there to a minimum."

Beyond power issues, analog designers are focusing on the task of bringing better quality and usability to an emerging generation of personal communications and entertainment devices. "There's audio everywhere and people who never cared about it before now care about it all the time," Rhode says. "For us, audio is a big deal and its importance is increasing every year."

The automotive market is also turning to analog designers in ever-greater numbers for technologies that will support a new generation of

infatinment devices and safety systems, such as accelerometers that automatically initiate airbag deployment during a crash. "Fifteen years ago, there was nothing in your car that measured acceleration or rapid deceleration," Robertson says. "You had a speedometer, but the only thing that told you that you had gone through an event of rapid deceleration was your forehead hitting the windshield."

Alternate Instruction

Preparing for an analog design career, or upgrading existing analog skills, can be difficult in a world that seems to place digital instruction first and foremost. Rhode, for instance, feels that higher education has dropped the ball on training, forcing vendors themselves to teach their analog designers how to work with the latest technologies. "You can't find many universities with an audio curriculum, for example," Rhode says.

As higher education increasingly focuses on digital instruction to the detriment of analog, employers are responding by creating in-house mentoring programs to fill an ever-deepening talent deficit. While a college degree remains a vital entry ticket into analog design, most companies hiring analog designers are also looking for individuals who have innate design talent and an ability to learn from colleagues on the fly—in other words, the sort of people who, in their younger years, would have congregated with their friends around a soldering iron and a schematic rather than a PC or game console.

"The first year out of school, if you've picked a good company to work for, you'll learn more than during the last four years combined," Rhode says.

Like most analog design executives and managers, Rhode is a strong believer in on-the-job training. "As a professor once told me, a bachelor's degree proves you're a trainable rat. A master's degree gives you a couple of tools in your tool bag and furthers your ability to learn," he says. "But you don't really put all your flesh around that degree until you've picked up a job... and finished a product to the point where somebody is willing to pay for it."

Mentoring also plays a big role in analog career advancement, helping designers gain hands-on skills in a real-world environment while still pulling down a paycheck. "We pair them up with a craftsman, somebody who can help explain the material as an individual has questions," says Tim Kalthoff, chief technologist for high-performance analog devices at Dallas-based Texas Instruments.

Linear Technology takes a similar approach. "We look for a guy who has his analog basics, someone who likes to do circuits, and we pair him with a senior guy who knows what can go wrong," Dobkin says.

The New Old Black Magic

Robertson notes that analog design is renowned for containing at least a little bit of black magic, an ability to squeeze performance out of components and circuits in ways that seem to defy reality. "That's because simulations don't always show you everything you need to know. Lab skills are vital," he says. Robertson also says that a great analog designer, someone who really has "the knack," doesn't just work things out in simulation or on paper. "They've got solder under their fingernails and they've actually been back in the lab and they know what works and what doesn't work."

Kalthoff says that TI wants designers with analog in their blood, individuals who discovered at a tender age that the have a natural ability to put things together and make them work. "When we interview folks, we test their fundamentals—I'd almost call it intuition—and understanding of how circuits work," he says. "That's what we try to get out of a basic interview, even for a senior designer, but then the rest is on-the-job training."

Among their many attributes, analog designers are widely valued for their expansive and flexible knowledge. "Breadth, in many cases, is at least as important as depth," Robertson says. "You may need to know a little bit about a lot of things in order to get the job done."

Rhode agrees. "Analog products are getting smarter and smarter, and it requires a breadth of knowledge that is ever increasing," he observes.

Expansive and nimble thinking comes in particularly handy for designers working at startups and other small companies. "If you're the only analog guy in the building, then you'll do the design and when the silicon comes back, you'll go into the lab and test it," Robertson says. "But at bigger companies... it's specialized so that the designers design and the characterization engineers characterize and the test engineers test and the applications engineers write the datasheets."

Yet if done to excess, specialization can easily lead to myopia, Robertson observes. "People know a lot, but they don't understand as much as they know," he says. "So I think crossing over disciplinary boundaries helps improve understanding, at least in our experience."

It also can't hurt to have at least a smattering of digital knowledge, Rhode says. "There's just no such thing as an analog guy who only knows analog," he notes. "You need to be able to write Verilog models, for instance, because the digital guys that you're hooking up to are going to want to be able to model the whole system."

Getting an Edge

Ray Parkhurst, a research and development section manager at Avago Technologies in San Jose, Calif., says that a solid understanding of physical principles creates an edge that can propel analog designers ahead in their career. "Physical principle is really important, because we're always pushing the envelope of every new technology and, as time goes on, the requirements get more and more difficult," he says.

Versatility is another attribute that often pays big benefits in the analog job market, helping to make cross-discipline experts highly employable. "Analog designers who are really good are usually a consultant to several groups within a company. It's easy for them to get jobs when other jobs are not available," Dobkin says. He also recommends that designers focus on developing and refining their basic skill set. "To be a good designer, you have to increase your vocabulary," he says. "You have to look at a large number of circuits and figure out what they do."

Developing a business marketing sense to accompany solid technical skills is a technique many analog designers have used to move from a cubicle to a corner office. "Having an understanding of the system that the chip is going to be sold into is the first step," Rhode says. The Cirrus chief also notes that an ambitious design engineer might want to dedicate some time to occasionally traveling with company

marketing pros.

"For the right folks it's fun, and that's what launched me on the career that ultimately had me in this job," he says. "I started traveling with the marketing guy and then I realized that at some point they would pay me to travel around the world and drink beer with my friends, so I moved into marketing."

But no matter exactly what they do, where they go, or how hard they work, most analog designers thoroughly enjoy their jobs—their calling—and aren't afraid to tell other people about their love for non-digital circuits and components. "It's a little bit like having a conversation with an Eskimo about snow," Robertson says. "We can talk for hours and hours and hours on this stuff, long after everyone else at the party has run to the closets to hide."