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IC vendors come (back) to analog

As business cycle turns down, vendors with analog portfolios are in a better position than all-digital suppliers, for many reasons.

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As the industry enters one of its periodic downturns, the feeling I get is a variation on a line from the classic film Casablanca: "We'll always have [analog]."

Vendors are responding to the eternal nature of analog functions and principles, defined by both Moore's Law (actually, Moore's Conjecture) and the even stronger laws of physics. Now they are adjusting their strategies.

Why? Because analog is increasingly needed as a foundational, enabling technology. Analog, in the broad sense, deals with five fundamentals: signal input/output (sensors and transducers); power supplies; interfaces (level shifting, drivers/receivers); signal processing over the entire electromagnetic spectrum; and signal integrity. As digital systems increase in speed and density, analog issues don't go away, they become more challenging, more critical and less forgiving.

Despite the opportunities presented by Moore's Law, and the relentless pressure it produces on IC design and fabrication, "analog" is an ever-more vital part of the circuit, system and even software engineer's concerns. Every time the industry gets a cold, vendors with strong analog capability are in a better situation than digital vendors, while those with only slight or no analog capability realize that analog has better business potential, and so they start to get on with (or resume their connection to) the analog world.

From a business perspective, the longevity and potential profitability of analog (including power-related) ICs are due to different design imperatives, selling cycles, product lifetimes and customer perspective than the all-digital world. Unlike digital ICs, where the keys are density, die size and cost-per-wafer, analog tends to be focused on fewer active devices per die; die size is just one of many factors used to define cost.

More importantly, analog ICs tend to have a different value proposition for their users. A circuit designer may be willing to spend another 50 cents for a single, high-precision instrumentation op amp with a lower output-drift temperature coefficient. Yet this op amp has a relatively large die size and few active devices. Why spend the money? Because a better-performing device can eliminate an assembly line calibration cycle or performance issues in the field, which cost money and create headaches.

Further, the functions that analog provides within many systems tend to be relatively fixed from one product cycle to the next. So, even as the more glamorous digital and software portions upgrade relentlessly in a brutally short product cycle ("now with more memory and more features!"), there is less need to change the analog side. In fact, there is reluctance on the designer's part to do change: It's better and smarter to leave some of the product design unchanged, to reduce the number of new sub-circuits that must be juggled and debugged. Thus, analog parts have a longer, viable design-in life, providing chip OEMs with a better opportunity to recoup their investment, especially since manufacturing margins on ICs increases over time.

IC vendors know that analog markets are more defensible at the customer design level. That's why the top vendors are pushing investment in analog process, design, tools and engineers. It's also why we see vendors with little or no analog expertise attempting to get in on the act, adding basic analog functions to their portfolio in the hope of meeting a small slice of their customers' needs.

I suspect the smarter digital vendors also have another worry in the back of their minds: They know that Moore's Law can't go on forever; nothing does. At the same time, the demands for even more functionality-per-digital IC is pushing the design challenge, fab costs and power limits--perhaps to an unsustainable point.

A new approach will be needed, and it may turn out to be the old approach of doing it with analog, which can be more effective against current limits. After all, an analog filter costs only a few op amps, and consumes little power compared to a digital version implemented as hardware or in a programmable device (see National Semiconductor's LMV1088, a dual-input, far-field, noise-suppression microphone amplifier, or the work of MIT's Analog VLSI and Biological Systems Group, *www.rle.mit.edu/avbs/*).

Perhaps the future of ICs includes increasing hybridized monolithic devices, where analog signal processing takes on some of the formerly digital functions, and digital handles only those functions where it provides a clear performance or cost advantage.

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