[POV: Point Of View]

High-Speed, High-Performance, High-Voltage Technologies Converge

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Functionality is converging on platform devices as they become our primary conduits for voice, data, and video. This increase in functionality drives the need for more integration in both digital and analog ICs.

From a process technology perspective, digital's demands are relatively straightforward: deliver more bits per area by taking advantage of advances in lithography. Analog's demands are more complex, as analog encompasses the RF interface, data conversion, and power-management functions, most of which are typically designed using different process technologies.

Analog's diversity makes it difficult to achieve the integration levels these converging platforms require. One proposed solution has been to try to "fit" everything into a common process by forcing the integration of analog functions in digital CMOS. But in most cases, this is less cost effective than using multiple analog processes, is less competitive in power or performance, or is simply impossible—due to voltage or performance limitations.

ANOTHER OPTION

An alternative is to fold the requirements for high speed, high performance, and high voltage into a modular analog platform—as specialty foundries are doing. This provides the opportunity for cost-effectively realizing analog products that are less integrated by using a subset of the platform and then more easily integrating them into larger analog systems-on-a-chip (SoCs) by using a larger feature set from the same platform.

A complete analog platform contains CMOS as the base with modules like high-quality passive elements for mixed-signal content, thick metal for power routing or inductors, silicon-germanium transistors for RF and high speed, and high-voltage transistors for power management, amplifiers, and drivers.

Subsets of such a platform then can be used to serve RF, precision analog, and power-management products. The superset can be used to combine these products into a single analog SoC, serving a more targeted end application.

For the product designer, the platform helps drive efficiency by providing a solution for analog intellectual property (IP) reuse, as well as a consistent design environment. IP becomes more portable because features and models are shared across the entire analog platform. So, for instance, a bandgap circuit used on a radio-frequency (RF) IC can be reused in the power-management IC without change.

A modular analog platform makes the creation of third-party IP more attractive, as it can be leveraged across a wider array of analog markets while being built on a common process platform. By using the same platform across multiple divisions in a company, it also becomes easier to standardize the analog design environment, reducing overhead costs.

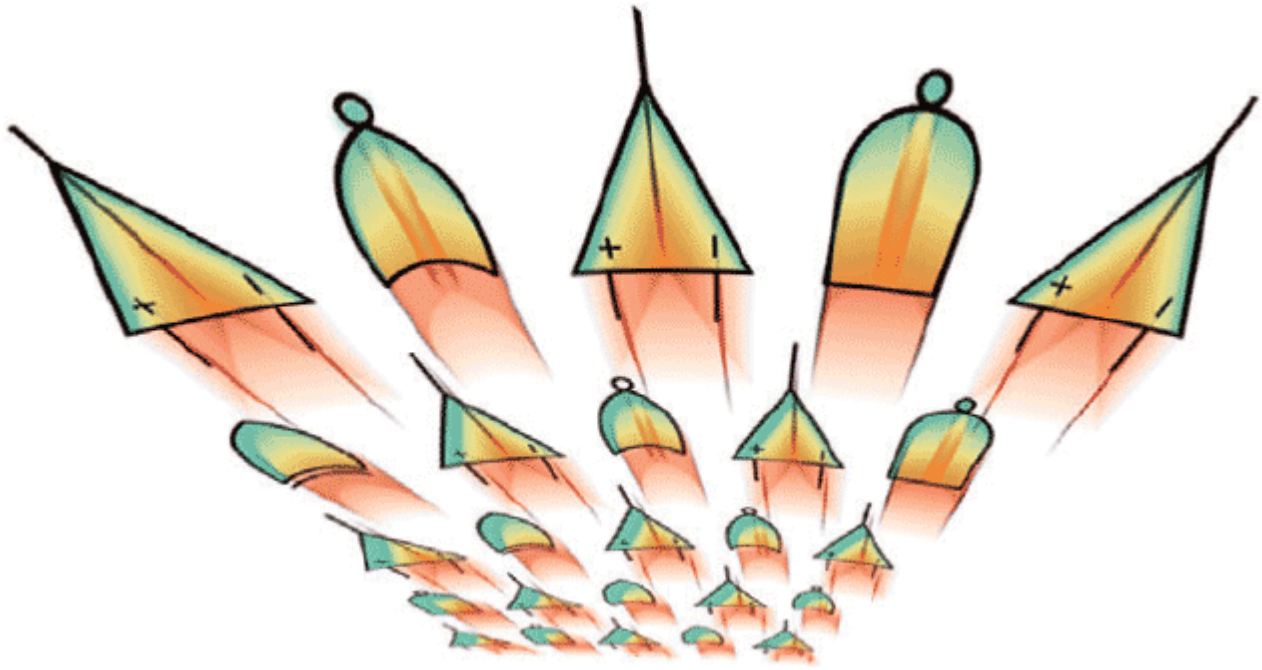
THE ANALOG/DIGITAL DIVIDE

By separating analog and digital functions, each can be optimally scaled to realize the lowest system cost. Digital circuits are scaled by reducing line widths, while analog circuits are scaled by increasing the density of passive elements such as inductors and capacitors.

As the speed of digital processes increases, more of the analog content can be absorbed into the digital domain and take advantage of reduced line widths. For instance, analog signals can be digitized by very fast analog-to-digital converters sooner rather than having to be first down-converted to more manageable frequencies in the analog domain.

This will change the boundary between digital and analog systems. But it's unlikely to reduce the overall analog content since the greater digital processing power will lead to more functions being integrated in the devices of the future, requiring even more analog interfaces to effectively communicate with the outside world.

Analog design is becoming more complex as new product designs must deal with a sometimes unfriendly outside world imposing higher speed, higher performance, and higher voltage requirements on the same piece of silicon. Specialty foundries are helping to make this analog complexity more manageable for chip designers by creating modular analog platforms. These platforms provide a common fabric for analog design and IP reuse, helping to further integration in the consumer devices that make voice, data, and video readily accessible.



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