



# Feel the power

**T**he driving factors for embedded system design over the past few years have been size, performance and cost. Throw in time to market and it's a tough challenge for any designer. And there's no reason to assume the future will be any different.

Embedded systems have broadly similar technology requirements. They need some form of computational element, which could be a microcontroller, a dsp or even an fpga. They need power handling – through dc/dc converters, for example – they need analogue components and they need software, including some form of operating system.

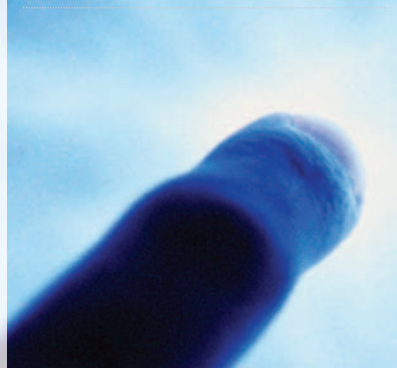
"One of the key trends for all electronic devices in the coming years will be energy efficiency," said Salvatore Napolitano, signal path marketing manager for National Semiconductor. "Increasing functionality in portable equipment demands greater battery life and mains powered equipment will be constrained by financial and environmental energy costs."

## Bit between the teeth?

Microcontrollers remain the 'intelligence' of choice in the embedded world. Historically, the 8bit micro has been the workhorse, but this may not be the case in the future. The reason? The 32bit micro is gaining ground.

Announcements over the last year include NXP licensing ARM's Cortex-M3 processor. On a similar tack, STMicroelectronics expanded the STM32 range – also Cortex-M3 based – to provide more flash, sram and additional support for displays, storage and advanced control.

*Embedded design in the future will be all about power. By Graham Pitcher.*



Microchip also dipped its toes in the 32bit market, launching a device built around the MIPS32 core. Paul Garden, product marketing manager for Microchip's high performance mcu division. "We've seen performance requirements grow beyond our 16bit product line, so we need to provide a product that enables customers to expand their applications to the next level."

But not everyone is convinced the future lies in 32bit. Texas Instruments is one, launching the MSP430F5xx range. Moving the MSP430 to a 0.18µm process, compared to 0.35µm previously, allows power consumption to be reduced and performance improved. Frank Forster, TI's microcontroller business development manager Europe, said: "There's a general trend towards lower power consumption," he noted. "The family will draw 160µA/MHz," he claimed, "and designers will be able to access five low power modes."

Cyan Technology also sees a rosy future for 16bit. But ceo Kenn Lamb

knows success needs more than just shipping silicon; he needs to ship solutions.

Cyan is doing that through Cy-Solved, a range of preconfigured modules targeted at particular applications. "Our design value is writing application software that does difficult stuff 'out of the box'," he claimed.

## Analogue advances

Part of the size, power and cost balancing act is being solved by increasingly capable analogue components. Recent announcements from Analog Devices give a clue to where the technology is going.

Integration is an important driver, says Leo McHugh, product line director with Analog Devices. He points to Analog's recent introduction of the AD7190 data converter. "It's the first in a new range of 24bit sigma-delta data converters which will include a multiplexer and a programmable gain amplifier on board, along with on board reference and clock circuitry. Having a lot of parts on chip means that customers get fully tested and characterised parts with the blocks working together. This means time to market will be shorter."

With the ability to measure much smaller signals more quickly and with greater accuracy, system performance for precision instruments can be improved significantly.

National expects energy efficiency to be a significant driver for innovative designs and new technologies and has introduced its PowerWise metrics to help engineers specify components energy efficiently. Napolitano picked up the data conversion theme, highlighting National's



continuous time sigma-delta architecture. "This combines high performance with low power consumption," he explained. "The current product from National has a PowerWise figure of merit of 0.48pJ per conversion. We expect that this figure will be reduced by half within three years."

Data acquisition and communications



*"One of the key trends for all devices in the coming years will be energy efficiency."*

*Salvatore Napolitano, National Semiconductor*

systems will benefit from similar advances in the area of gigasample converters, Napolitano continued. "Increasing energy efficiency here will enable greater performance without the need for additional cooling measures to be implemented. This will enable designers to save board space, reduce system cost and increase reliability. The figure of merit for a typical gigasample converter from National is currently 4.36pJ/conversion and could fall to one third of this level in three years."

**Feel the power**

And power components will be just as important as designers look either to increase the operating time of battery powered products or to reduce power consumption of mains powered equipment as part of a broader effort to

mitigate the effects of climate change.

"Embedded power is becoming more of a challenge in industrial and consumer applications with complex sensor signal processing or daunting computing power requirements," said Alfred Hesener, Fairchild's director of marketing and applications Europe.

He noted such systems are often powered by leading edge devices. "The voltages needed to power these large dsps, asics, socs or fpgas keep decreasing, whilst supply currents increase. A large 65nm fpga may draw 4.2A in idle mode at 85°C from a supply voltage of 1V ±50mV. In operation, the current can go up to 18A, depending on the configuration, with very high dynamic requirements, due to the high switching frequencies. The particularly disconcerting thing about this is the high

current, in combination with high dI/dt current changes.

"As a consequence, power management



*Hesener: "Embedded power is becoming more of a challenge."*

is becoming more and more embedded in that it is being distributed across the pcb to be much closer to the load. Solutions include advanced point of load converters, like Fairchild's FAN2106."

**Open field?**

Programmable logic devices are in the vanguard when it comes to the latest process nodes. Altera gave a peek into the future recently with the launch of Stratix IV.

It's taken the opportunity to move to TSMC's 40nm process, bringing 'unprecedented' density, performance and low power consumption. "Stratix IV is twice the size of Altera's previous largest device," said Paul Hollingworth, senior director of Altera's HardCopy product group. Smaller process nodes mean more transistors can be packed into a given area. "That's a good thing when you're trying to get 2.5billion of them into a device," he continued. "We wouldn't have had that density even with a 45nm process."

Xilinx meanwhile completed its Virtex-5 roll out with the FXT variant. The top of the range part integrates logic, dsp functionality, embedded processors and connectivity options such as serial RocketIO.

This combination of technology means that fpgas are now far more capable of being the 'system on a chip' of which programmable logic companies have talked for the last decade.

Per Holmgren, director of programmable systems marketing for Xilinx, said: "Five years ago, the fpga was at the edge of the system. Now, it is the system."

But the development means that suppliers have to put support systems in place that weren't needed before. John Heighton, European product solutions manager, noted: "Virtex-5 FXT is a complex device, but the tools are more capable and the design process is easier. This allows more complex designs to be attempted," he concluded. ■

1995: Microsoft releases Windows 95. The DVD format is announced.

1997: IBM uses copper wires, rather than aluminum, to connect transistors in chips. The breakthrough allows up to 200million transistors to be placed on a single chip.