DSPs at the bottom end of the market are finding themselves used in an ever increasing number of applications. But how will they compete against the likes of Risc and microcontrollers? Steve Bush reports.

takes control

With hugely powerful super-scalar digital signal processors grabbing the limelight, it is easy to forget the bottom end of the market – the 16-bit fixed-point processors that sell in increasing numbers into products as unlikely as video baby alarms and fridges.

It is a highly competitive sector which is also the target of Risc processors and microcontrollers.

What are chip manufacturers doing to keep their share – or even increase it?

Jean-Marc Darchy is Texas Instruments' European dsp spokesman. He said: "There is still a lot we can do. The first thing is that dsps will be adopting the latest production technology. With an 0.18 or 0.15µm process, you can deliver for $5 three to four times the performance compared with a dsp from two to three years ago. For instance, our *5402* [due to sample next month] will deliver 100Mips for $5. There will be a variety of products on the market at this performance."

With 100Mips for $5, dsps will become more attractive in a market that is awash with Risc processors, microcontrollers, and existing dsps.

In some cases, fast dsps will have an inherent advantage. "DSPs will be better than microprocessors for voice coding and data transmission," said Darchy.

According to Darchy, there is a second factor that will affect forthcoming sales. "To win against microcontrollers, dsps will become more specialised and will focus on an application, or a cluster of applications, with specific on-chip peripherals. This will need a good understanding of the market and the products that will use the processors."

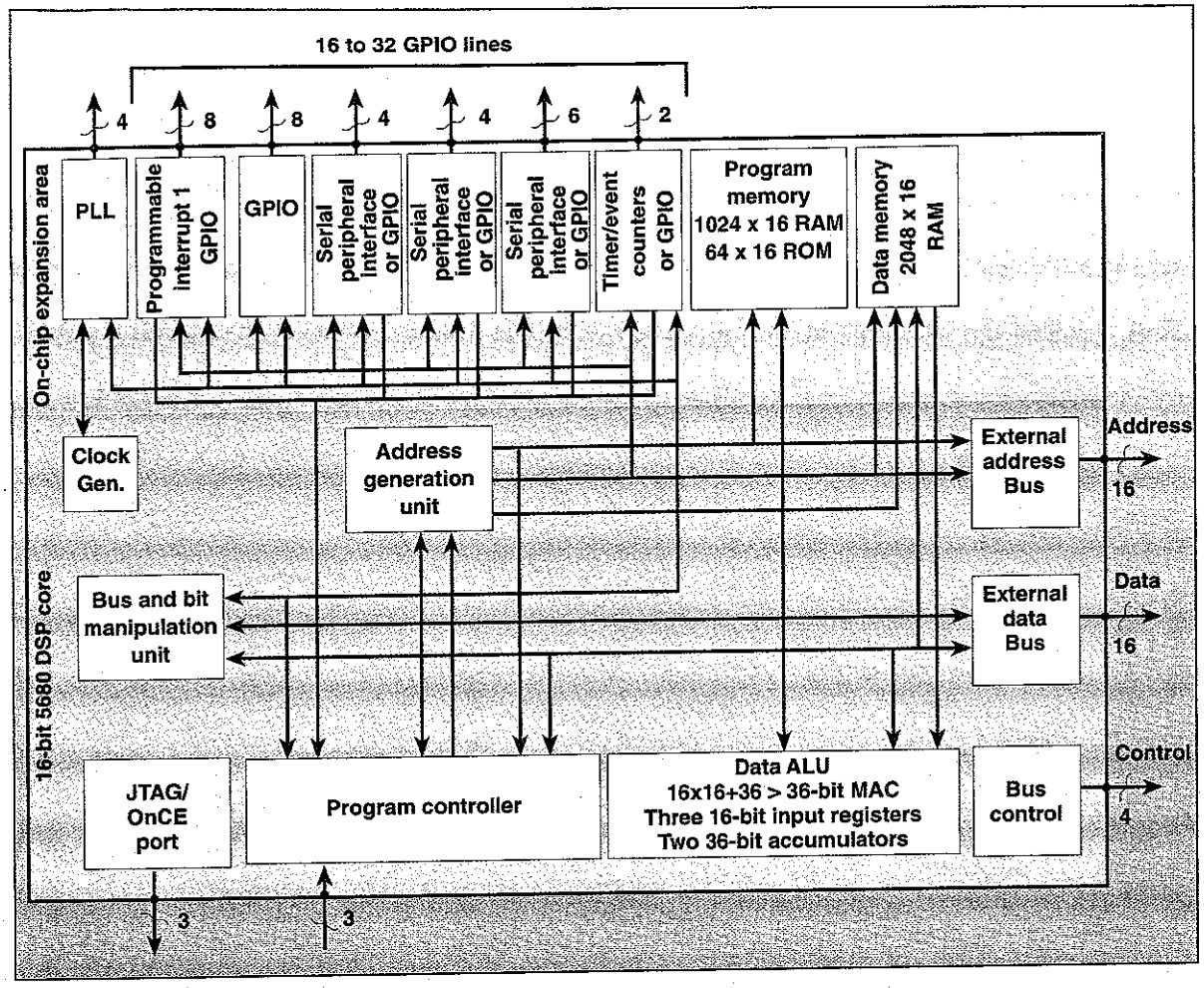
An example he cites is motor controllers, where TI, Analog Devices and Zilog already have dedicated dsp products. "This is a success. It was a pure microcontroller market which is now switching to medium performance dsps because the on-chip peripherals, pulse-width modulators and timers, focus the product on the application," said Darchy.

Applications likely to receive the attention of dsp makers in the near future, according to Darchy, include: point of sale terminals, payphones, imaging systems and remote data acquisition. "One dsp could handle all of the usual functions in a sales terminal, plus implement a modem to communicate with the store computer. It could perhaps do some voice recognition as well. For data logging, you will be able to measure parameters, perform calculations and transmit the results down a phone, all with a $5 dsp."

One company that already incorporates a wide range of peripherals on its dsps is Zilog.

"Typically a dsp has hardly any i/o," said Adam Provis, an application engineer with Zilog. "We add the sort of peripherals found in microcontrollers. For instance: a phase-locked loop to allow the chip to run from a low-cost 32kHz crystal, counter-timers, SPI serial port, 8-bit a-to-d converter and i/o ports."

He sees this as an advantage in simple consumer products. "Typically, a microcontroller cannot handle voice compression for storage into flash memory or for transmission, whereas a dsp can. In walkie-talkies, baby alarms and similar products, you can choose to use a dsp for compression and a microcontroller to handle the housekeeping



Peripherals are appearing on dsps, moving them on in the same way that they turned microprocessors into microcontrollers.

functions like battery management and operating the human interface, or you can use a single dsp part that does everything."

This 'everything' includes storing its own program code, as Zilog's range includes one-time programmable and mask-rom on-chip memory options, but not yet flash. "We will have flash memory in the second quarter of next year," said Provis.

He sees two other ways to make dsps more attractive.

One is to offer them in small packages. Zilog has one in a 44-pin PLCC; the other is to keep development tool costs low. Provis said, "Our lowest cost in-circuit emulator is $99. This is a full function emulator, the only thing that it hasn't got is a hardware trace."

Motorola's *56800* family, currently at 35Mips and mapped to 100Mips in 2000, is another with multiple microcontroller-like peripherals laying claim to a similar range to Zilog's.

Power consumption is also important, not only in portable equipment, but as a way of reduced fixed and recurring costs in mains-powered installations.

DSP chip makers are not blind to this and are taking steps to drop power consumption even as performance increases.

"Because of the processes used," said Analog Devices' Andrew Lanfear, "in some cases 32-bit dsps can cost less than 16-bit alternatives."

This can make the 32-bit device look attractive, even when the application only demands 16-bit capability. "But the 16-bit dsp is likely to consume less power in the application," said Lanfear.

As an example of low power consumption, he puts forward the *ADSP2189*. "It is a 75Mips device that can run two V.90 [56kbit/s] modems simultaneously. But it consumes only 0.4mA/Mip at a core voltage of 2.5V."

The core behind the *ADSP21xx* family has been around for a while now, constantly increasing in performance. Now at 75Mips, "we expect it to top-out at 100Mips," said Lanfear, "In future we are looking at a new instruction set architecture and a new core. This will be further down in power consumption and with much higher performance. But we are not releasing dates yet."

Analog Devices and TI are the 'big two' in dsp. Is TI looking at architectural changes for its low-end processors?

"I suspect not," said TI's Darchy. His argument is largely financial: "Going to smaller, faster processes is quickly moving low-end dsps towards top-end microprocessors. A $40 to $50 dsp three years ago is only $10 now."

There is also a reason why moves to new architectures are actively undesirable. "Keeping the same architecture is a more robust, efficient and economic way to get the best out of a company's existing software base and tools," said Darchy.

Up-to-date semiconductor processes, combined with microcontroller peripherals are pushing 16-bit fixed-point dsps into applications formally reserved for microcontrollers. Power is going down and speed is going up.

The likely result is 'high-tech' consumer goods that feature voice and video compression; speaker phones, security products and baby alarms are the kind of products that should benefit. ■