Healthy approach to integrating analogue

Engineers now expect their analogue building blocks to come fully integrated. By **Graham Pitcher**.

Mixed signal and analogue design has always been considered the 'harder' part of the electronics business, with solutions often generated by 'silver backs' with long experience of the intricacies of the technology.

But the market is moving more quickly and time to market is an ever more important element of product design, which means custom solutions to the analogue requirements are becoming something of a luxury; engineers are looking for more integrated products to help them get their designs out of the door.

Chris Neil, senior vice president of Maxim Integrated's industrial and medical solutions group, said: "Customers have been designing systems based around building blocks for quicker time to market, but they are now pushing for more performance from these building blocks." This trend is pushing companies like Maxim to move towards system solutions. "Our system knowledge is important for the future," he added. "It allows us to develop products that work well together and we can then integrate them either on a chip or within a System in a Package."

Maxim has been developing this approach for the last five years and the progress can be seen from the balance between building blocks and what it calls 'high integration' products. In 2007, high integration products represented 18% of its portfolio. Last year, that proportion had risen to 47%.

These solutions are being targeted at a range of end applications and demand is growing strongly. According to market researcher IHS iSuppli, demand from the industrial sector is growing by 9% a year. Neil said this compares to an overall growth in demand for analogue parts of '2 or 3%'. "Analogue is solving expensive problems," he claimed, "including healthcare and remote monitoring."

Maxim is targeting a number of sectors with its high integration approach, including healthcare, industrial automation, energy and secure payments. "All of these applications need accurate measurement, robust communications and proven security," Neil claimed. "They also need parts which have low power consumption, efficient use of batteries and good power management."

Healthcare is a particularly attractive market for Maxim. "The market is changing," Neil observed, "with a need to reduce costs. This is seeing a move to prevention and life monitoring, with patient care outside of hospitals." Applications which the company is targeting range from diagnostic equipment to fitness equipment. "Analogue content in this sector is growing by 13% a year," Neil added.

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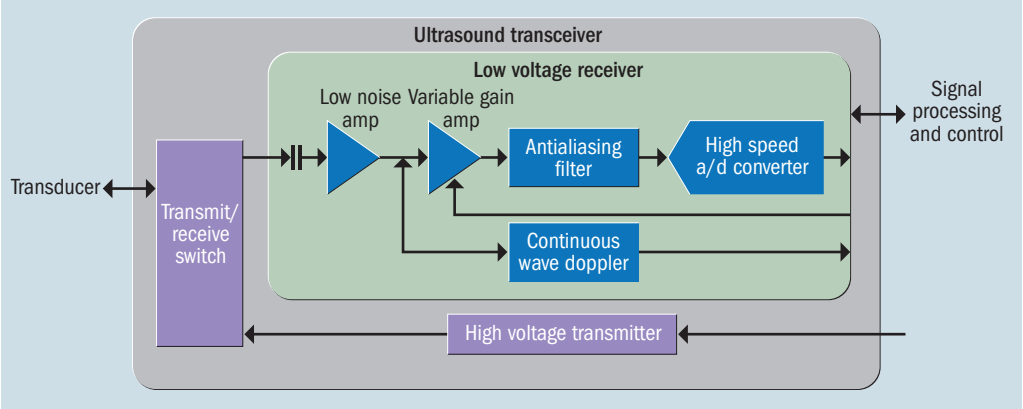
One particular example of where integration can bring benefits is in ultrasound equipment. Developers of these devices are looking to offer better performance and more channels, but the traditional format is increasingly unable to meet these demands.

In modern ultrasound devices, signals are captured by a hand held unit and passed to the signal conditioning and processing electronics via cables. These cables need to be of high quality and adding more channels means more cable. "It gets expensive," Neil remarked.

Manufacturers are looking to move the image processing operation into the hand held probe, but that in itself brings other challenges. When

Fig 1: Block diagram of one channel in the MAX2082



Modules solve design problems

Linear Technology's µModule products are System in a Package (SiP) solutions that reduce design time, as well as board space and density issues.

According to the company, micromodules can reduce design time significantly; by up to 50% in some instances. Devices in the µModule family integrate key components commonly used in discrete power, signal chain and isolated designs, with the solution supplied in a compact form factor.

The product family embraces a set of applications, including point of load regulators, battery chargers, LED drivers, power system management, isolated converters, isolated transceivers and signal chain receiver solutions.

The latest addition is the LTM4633, a triple output 10A step down regulator supplied in a 15 x 15 x 5mm bga. It also features an integrated heat sink that enables output to deliver 10A at 1.8V from a 12V supply.

The LTM4633 includes dc/dc controllers, power switches, inductors and compensation. The output voltages are adjustable from 0.8V to 1.8V on two channels and from 0.8V to 5.5V on the third. Its three switchers have separate input power pins and operate from inputs ranging from 4.7V to

16V. For loads in excess of 10A, channels 1 and 2 can be paralleled to support up to 20A. Output overvoltage and overcurrent fault protections are included in the regulator. The LTM4633's internal temperature can be observed via two internal temperature diode monitors located next to the power stages.

processing is performed locally, there is more heat generated and regulations restrict the amount of heat that can be given off.

While Neil said it isn't possible to achieve this at the moment and keep within the regulations, Maxim has launched the MAX2082 (see fig 1), an octal transceiver said to consume 30% less power and to have a footprint 50% smaller than conventional solutions.

MAX2082 integrates eight channels of three level 200V pulsers and transmit/receive switches, an octal a/d converter and an octal low noise amplifier, as well as an octal variable gain amp, antialiasing filters and coupling capacitors into a small package requiring less than 10 square inches. Traditional designs, says Maxim, require at least nine components in the transmit/receive switch for each of up to 128 channels. In this way, MAX2082 can displace 'thousands of discrete parts'. Meanwhile, power supply noise and switching noise are minimised to boost image quality.

Meanwhile, demand for wearable wireless medical devices is predicted to reach 100million units a year by 2016. Looking to take advantage of this, Maxim is developing updated versions of the FitShirt, its wearable ECG solution introduced in 2012 and featured in the 12 Feb 2013 issue of New Electronics.

The electronics content in the second generation of the FitShirt (see fig 2) takes up 70% less space than in the first version, but power efficiency is boosted by a factor of 40. Neil claimed the device would have a battery operating life of 140hr, despite being powered by a battery with a quarter of the capacity of the original design. Ultimately, he predicted, the FitShirt would be powered by energy harvesting.

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Chris Neil

Many of the applications which Maxim has in its sights also require some element of security. In the medical market this is about protecting people's information and Maxim is using the PUF – physically unclonable function – approach (see fig 3). "The difference between pieces of silicon is enough to be measured," Neil explained. "It's like a fingerprint and brings inherent security."

For industrial applications, Maxim has launched the DS28C22 DeepCover Secure Authenticator, which provides the ability to protect sensitive data with multiple layers of physical security. Using the FIPS 180 based SHA-256 authentication algorithm, the DS28C22 takes a bidirectional approach in which host and peripheral are required to authenticate each another. According to Maxim, the DS28C22 provides security for such applications as peripherals/disposables, sensors, network equipment, IP licensing and industrial devices like programmable logic controllers.

Neil concluded: "Security embedded in hardware is a lot more difficult to crack and hardware based security uses less power than software."

Fig 2: The electronics for the second generation FitShirt

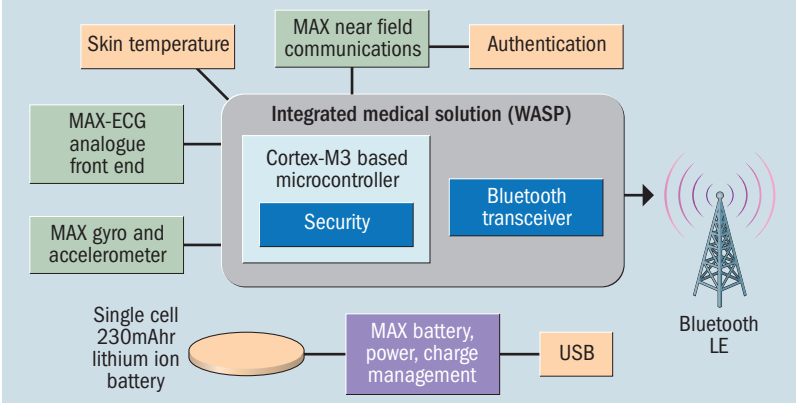

Fig 3: Maxim's trust protection concept