Designs on the future

Programmable mixed signal device looks to mop up utility functions. By **Graham Pitcher**.

In the mid 1990s, there was a flurry of activity as companies attempted to emulate the success of the fpga in the analogue world. These programmable analogue parts, for a number of reasons, failed to capture the interest of electronics designers. Since then, Cypress has had particular success with its PSoC range, which integrates analogue and digital peripherals, memory and a microcontroller on the one chip.

But the attempts at creating programmable mixed signal parts have not gone away and one company which is developing a successful business based on this approach is Silego.

John McDonald, pictured above, vp of marketing, said Silego started up about 10 years ago as a venture backed fabless company addressing the pc timing clock business. "But that changed when Intel gave a two year warning that it would integrate the clock into a chipset. At the time, that sector represented about 95% of the company's revenues and, in 2010, most of that disappeared."

The result, he said, was almost like turning Silego into a new start up. "Today," he continued, "75% of our revenue has nothing to do with timing. We took a close look at such products as notebooks and asked ourselves 'how can we make the design better and cheaper? and 'what value can we add?'."

Its conclusion was partly related to the cost of packages. McDonald continued: "The package often costs more than the silicon which is inside, so we set ourselves the target of finding the most cost effective functions and integrating the best technology."

One example of this innovation is GreenClk, a silicon based 32.768kHz crystal replacement technology. When combined with a MHz crystal, the device provides what McDonald says is a cost effective chip with multiple 32.768kHz and multiple MHz clock outputs. "We took a crystal with PPM accuracy, pulse powered it and used it to calibrate an RC oscillator. It can do a lot of frequencies, including phase locked loops. It provides better performance and is smaller. We will ship more than 30million of these devices in 2011."

But the product line which holds promise, in Silego's view, is GreenPak – programmable mixed signal arrays developed entirely in house. "Using our development kit, most customers will have finished their first project in just a couple of hours," McDonald asserted. "There's no compiler to learn and the development kit has a microcontroller which acts as a function generator, allowing projects to be completed quickly."

Why does McDonald believe that GreenPak will succeed where many other companies have failed in the past looking to achieve the same goal? "Most failed because they over designed their chips," he said. "For example, we have an 8bit a/d converter in GreenPak. If you put in a 16bit converter, the customer may not be interested because the cost is too high. GreenPak doesn't offer super high performance because not all applications need high performance."

McDonald points to flexibility and ease of configuration. "It's faster to reach into your inventory, pull out a GreenPak chip and adjust the two comparators than it is to buy two comparators from a distributor."

GreenPAK 2 is the second generation product. The one time programmable micro fpga features programmable analogue components and is supplied in a 2.5 x 2.5mm TDFN-12 package. The device operates from a supply in the range from 1.8 to 5V and acts as a small, low power component for commonly used mixed signal functions.

Users create their design by programming non volatile memory in order to configure interconnect logic, I/O pins and macro cells. This allows a variety of mixed signal functions to be handled within a small, low power part.

"It's a broad market chip," McDonald noted. "But, having said that, there are particular areas where it should prove valuable. It can be used in a lot of places; for example, as clean up logic in a power sequencer."

In some way, Silego is turning back the clock

Fig 1: The GreenPAK2 architecture
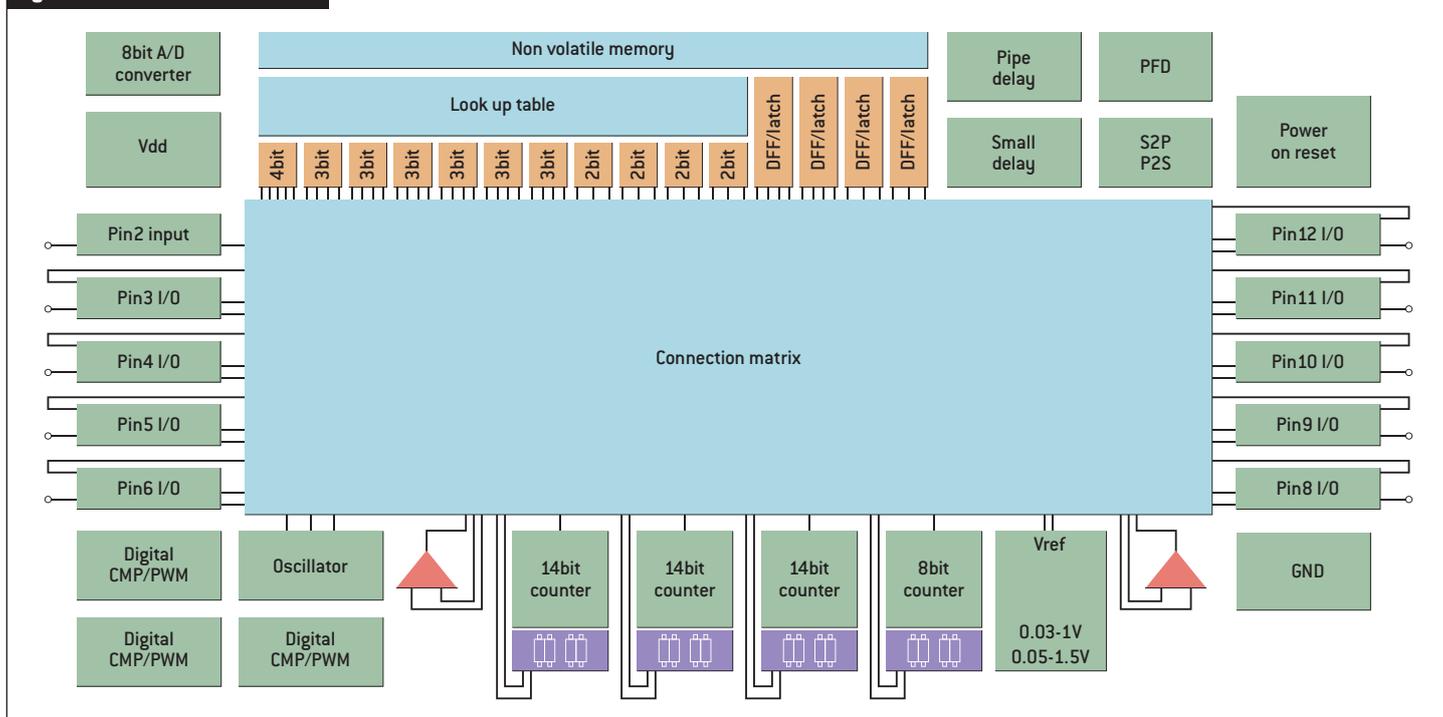
with this approach; far from using complex plds (cpld) to mop up distributed functions, Silego believes the opposite approach is more appropriate. McDonald continued: "People might use a cpld on a board. We say you can replace one cpld with five or six GreenPak devices distributed around a board. When you do, you save money and don't have to bother about reordering signals in and out of the cpld."

Testament to the device's potential, Silego has sold 100m GreenPak parts in the 18months since the device was launched.

"Intrinsically, it's a small device designed with

cost in mind," he continued. "By using a few gates of logic, some capacitors and resistors, designers can reduce the number of discrete logic gates they need and end up with cheaper products, using less power and with a smaller footprint. It even offers a nanosecond response time and active current consumption in the nanoAmp range."

GreenPAK is said to be suitable for replacing 4 and 8bit mcus, as well as integrating glue logic, low to high level shifters, power-on resets, voltage monitors and other utility functions. GreenPak features seven look up tables: two 2bit, four 3bit and one 4bit. GreenPak 2 boosts this to 11 LUTs:

four 2bit, six 3bit and one 4bit.

McDonald believes GreenPak's power lies in the software used to program it. "With GreenPak Designer, you see something like an Orcad schematic capture screen," he claimed. "It's simple to build a wiring diagram and the process requires no code, no compilers and no library files." Amongst blocks available are an a/d converter, two analogue comparators, voltage reference, counters and programmable delays.

GreenPAK 2 Designer also allows users to create test platforms without having to program the device. The test bench uses external switches and the mcu on the development board to create test patterns. Once the designer is satisfied, they can program the chip or can change the design.

Now, Silego is looking to expand the range further. "GreenPak 3 is in definition," McDonald concluded, "and these parts will have 16 or 20 pins. We had 30 design wins for GreenPak 2 before we had released the design tools. Those customers are telling us they have run out of I/O pins, so we need to expand the range. GreenPak 3 will have 50% more logic and the voltage rail will expand so the parts can be connected directly to a lithium ion battery."
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Fig 2: GreenPAK2 compared to a discrete logic design