

This robot car demonstrates the capabilities of Cortex-M3 based silicon. It includes features such as Zigbee radio and support for a/d converter channels. A video demonstration of the vehicle can be seen online at www.newelectronics.co.uk.

in the UK), although ARM once had concerns over the channel's ability to provide sufficient technical support.

There were good reasons for this choice of a start up lead partner, according to Hadyn Povey, ARM's cpu product manager with responsibility for the M3. His company had confidence in Luminary's founders – Booth and ceo Jim Reinhart had been key members of the embedded computing team at Cirrus Logic. But the decision had more to do with the disruptive nature of the new core and the target market.

"The 16bit and high end 8bit microcontroller is entrenched inside a number of our traditional partners and why would they want to upset that business? Luminary is a hungry and focused organisation and, for the M3, we can go out

I'll buy that for \$1!

For Jean Anne Booth, chief marketing officer of Austin based start up Luminary Micro, it was the proverbial 'no brainer'.

"I've known the ARM guys for a long time. We had talked about various projects, but I was at a company that didn't want to evolve in that particular way. Still, I knew what ARM had in development and, in 2004, I was looking at what I wanted to do next," she says.

"When I looked closely at the technology and the options, I realised we could build (an) ARM (based micro) for \$1 profitably. I said, 'we have to do this'."

In March, Luminary released its Stellaris microcontroller, the first based on

ARM's Cortex-M3 core gets its first outing in a \$1 microcontroller.

By **Paul Dempsey**.

ARM's Cortex-M3 processor. It now has 19 parts available and the \$1 entry price highlights that the M3 is ARM's 32bit bid for the low cost, deeply embedded 8bit and 16bit mcu business.

ARM arranged the silicon debut for its latest core by working with a start up – not an IDM nor with an established fab-less player. The parts will also go through distribution (Alpha Micro Components

there with them and start creating the turbulence, accelerating the migration to 32bit," says Povey.

Another factor was the lag between ARM releasing a core and its incorporation in silicon. Povey says automotive OEMs showed early interest in transitioning to 32bit mcus. There are today nine M3 licensees, but only three have gone public – STMicroelectronics, Actel and Luminary. Right now, Whilst ST is refusing to say which applications it will target, jaws will plummet if automotive is not one of them.

"But," says Povey, "the nature of automotive is that you are filling sockets which only appear every five to 10 years. It's then



a couple of years battling to win the socket. When you do win, you have to wait until the units are made, fitted into a car and are out there. That's when you hit volume and it can be a six year thing. It does not have general or immediate visibility."

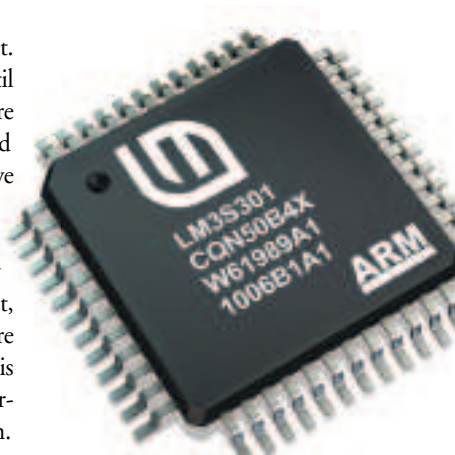
Luminary is deliberately ignoring automotive. "Go into a VC and say you've got this great automotive product, but volume is a decade away, and you're toast," says Booth. Instead, the company is going after the general purpose mcu market, where visibility is distribution driven.

"[Luminary's US distribution partner] Arrow North America's 8bit micro sales last year were roughly \$380million. That exceeds what's shipped by any one manufacturer directly, probably a lot of them combined. When we looked more closely, the largest customer was \$1m," says Booth.

In this context, she describes the typical Luminary customer as a company with 'three to five engineers working on a development schedule that's probably nine months and buying somewhere between 5000 and 50,000 units per year'.

This profile dictated other aspects of the launch strategy, with Luminary convincing ARM that the marketing had to be based equally on what 32bit offers and the simple question 'Why not?'

"Price does matter, because ARM for



Fast track

Luminary Micro developed its Stellaris family at breakneck speed.

"We got first funding in February 2005 and concluded our licence with ARM at the end of March," says Booth.

"Then, we took what I'd call an engineering snapshot of the M3 in May 2005 and taped that out by September. So we were looking at some first silicon last year. We then took the first formal release in early December 2005 and taped that out 24 hours later."

Development work included 'stealth' aspects. Luminary announced it was looking for partners through anonymous emails and website banners – and only in the US, UK, Germany and Italy. "With what we we're doing and as a start up, putting the name and everything else out there would basically have said, 'Hey, look over here. Come kill us!'," says Booth.

Today, Stellaris prices range from the \$1 LM3S101 to \$5.47. Features include up to 64k of single cycle flash, 8k of single cycle sram, speeds up to 50MHz, and up to eight a/d converter channels running at up to 1Msamples.

a buck is comparable to 8 and 16bit," says Booth. "But there's more to it. You need the pitch to say, 'We make this easy for you'."

Technically, the M3 is simplified in comparison with other ARM cores. For example, there is only the Thumb-2

instruction set to worry about and the entire code base is written in C/C++ with no assembly language. There is also ARM's 'eco system' of support tools, including its RealView Microcontroller Development Kit.

"One of the biggest pushes in our alpha programme was making sure we had everything in place to release product directly into the distribution channel. Is the documentation OK? Do we have the right app notes? Do we have the right tools so people can figure this out without everyone calling us?" says Booth.

"Take our development kit. We have evaluation kits that are single tool solutions, but the development kit comes with evaluation versions of a couple of different toolsets because it's targeted at 8 and 16bit upgrade guys who don't necessarily know whether they want Keil, IAR or GNU. They're coming over from 8051 or TI or Microchip and don't know what they want until they try out all the options."

So how is it going? ARM certainly seems happy with progress and Luminary is now claiming design wins in the hundreds. Turbulence, but of a good kind. 