

SILICON UPDATE

News Notes Special Edition



ESC Title Bout

By Tom Cantrell, author of *Circuit Cellar*'s "Silicon Update" Column

With all the macroeconomic angst and headline gloom and doom, I was afraid this year's Embedded System Conference in Silicon Valley might be a somber affair. But I was pleasantly surprised. Behind the bailouts, the Silicon Wizards are working hard to deliver the new technology that will drive the next wave of deeply embedded innovation.

ESC is an opportunity to chat with really smart people. It's all the better when I bump into *Circuit Cellar* readers who invariably have something interesting to say. One longtime reader was kind enough to say he enjoys reading my columns and gets a kick out of the way I turn a phrase in my titles. That gave me the idea of reusing a lot of those past titles in this ESC round-up. Kind of a reminder that the challenge of delivering more for less never ends. So let's head back to the future.

LIQUID CRYSTAL DELIGHT ([CIRCUIT CELLAR 132, 2001](#))

A lot of designers want to put a pretty face on their embedded designs using a fancy (e.g., 1/4 VGA+) LCD—all the all the better if it has touch screen capability. You can redesign from the ground up, but in many situations, it's easier and less risky to retrofit an intelligent graphics subsystem to an existing design.

Amulet offers a highly integrated chip that fills the bill. Just add glass, and voila, instant eye-candy (<http://www.amulettechnologies.com/products/starterk.html>). Well, not quite. There's still the small matter of all the software to deliver the glitz. A typical LCD subsystem comes with a library of graphics primitives (draw, fill, paint, etc.). Indeed, the Amulet GUI chip comes with that option (i.e., built-in graphics primitives that are manhandled via UART connection to your design).

But Amulet's real claim to fame is a different scheme that exploits the ubiquity of HTML. The idea is that you can use standard web page authoring software (e.g., Dreamweaver) to craft your display as a virtual "web site." Indeed, the final step in the process simply has you point the Amulet "micro-HTML" compiler at the INDEX.HTM file comprising your screens and it handles the rest.



Make no mistake: it doesn't support all HTML features of a full-fledged web browser, and the best results will be achieved by folks who know how to get under the hood with HTML and web-authoring software. But that's probably as it should be considering the artistic skill required to make an impression. I had a chance to play around with Amulet's starter kit and can attest it has the attention-grabbing FX and "widgets" your app needs to standout from the 4-line-by-20 crowd.

As an aside, Amulet's fancy graphics chip comes courtesy of a CAP7L customizable SoC from Atmel. The CAP7L combines a full-featured hard-core ARM7 MCU with 200,000 gates of metal-mask programmable logic. Minimum order quantity is just 10,000 units with turnaround as fast as 12 weeks. A low \$75,000 NRE supports fully amortized unit costs as low as \$5 (and there's no separate ARM license fee). You can even use a low-cost FPGA tool chain to develop (and prototype with Atmel's FPGA-based starter kit) your custom logic

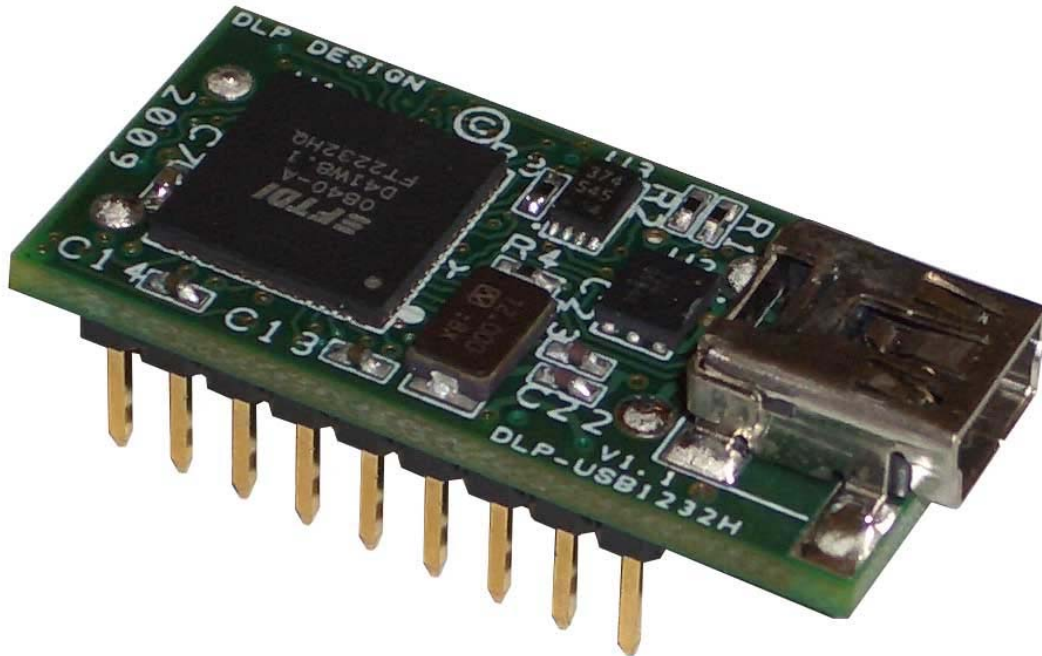
	CAP9	CAP7
MPCF	500K Gates 250K Gates	450K Gates 250K Gates
CORE	ARM926EJ-S @ 200 MHz	ARM7TDMI @ 80 MHz
SRAM	16K/16K Cache, 32K Bytes	160K Bytes
MPRAM	8xSRAM 512x72 10xDPRAM 512x36	2xDPRAM 2Kx16
ROM	32K Bytes	256K Bytes

(http://www.atmel.com/dyn/resources/prod_documents/doc5215.pdf).

It's not often you'll find me using words like "quick," "easy," and "cheap" in the same sentence with "ASIC," but CAP7L comes real close.

OH SAY CAN USB (CIRCUIT CELLAR 74, 1996)

With all the excitement on the wireless front, the success of USB reminds us that wires are still good for something. Given the usual onward and upward trend, I wasn't surprised to see FTDI expanding their line of popular USB chips with Hi-Speed (480 Mbps) capability. DLP Design offers a handy 18-pin DIP module using the new FTDI chips, and an easy way to shift your next embedded USB design into overdrive (www.dlpdesign.com/usb1232h-ds-v10.pdf).



Meanwhile, at the other end of the spectrum, check out the KEYBOARD EK touch-sensing kit from Silicon Labs. Classified as a USB human interface device (HID), it takes advantage of the fact HID support is built into Windows so no driver installation is required (<https://www.silabs.com/products/mcu/Pages/KEYBOARD EK.aspx>)

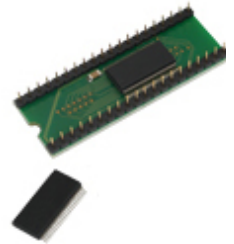


Ditto for the IO-Warrior chips from Code Mercenaries. I was turned on to by their distributor Saelig. The IO-Warriors use an HID façade to front common embedded I/O functions such as

keypad and LCD, I²C, and parallel I/O.

IO-Warrior40

- 32 I/O Pins, typ. 125Hz read rate
- IIC master function, 100kHz, throughput typ. 750 bytes/sec
- Controlling HD44780 compatible displays and some graphic modules*
- Driving a up to 8x32 LED matrix
- Driving a 8x8 switch or button matrix
- SSOP48 package, DIL40 module (DIP40 package only as part of the starterkit!)



(http://www.saelig.com/miva/merchant.mvc?Screen=CTGY&Category_Code=MFR094)

Sure, imitating a mouse or keyboard is old school, but it still works fine for low data-rate apps. Kind of ironic that mice and keyboards were the genesis of USB in the first place, and now we're getting ready for USB 3.0 with 5-Gbps "SuperSpeed" on tap. Party on!

POWER TRIP (CIRCUIT CELLAR 97, 1998)

Green is the new black, and energy harvesting is all the rage. Outfits like Cymbet and Infinite Power Solutions (IPS) have been generating a lot of buzz with their innovative lithium batteries.

The Cymbet EnerChip is aptly named with an IC-like surface-mount package and ability to utilize standard PCB production techniques, while the IPS "Thinergy" cell (less than 1/100² thick!) is kind of an energy "stamp." Both are capable of enabling a broad-class of "Batteries Included" apps (i.e., no battery changes required, ever).



(<http://www.cymbet.com>)



(<http://www.infinitepowersolutions.com>)

I'll be taking a closer look at both of these bite-size beauties in my Silicon Update column, so stay tuned.

TOOL TIME (CIRCUIT CELLAR 221, 2008)

I might call the C programming language many things (some printable), but "toy" isn't one of

them. But that doesn't mean it can't be a language for toys. IAR announced they're giving away a free version of their popular Embedded Workbench C toolchain that works with the Lego Mindstorms robotic building kit. The compiler is limited to 128 KB of code for the Atmel flash ARM-based MCU used in the Lego kit, but otherwise includes all the features of the industrial strength version. All you've got to do is hack a cable for the JTAG debug connector.

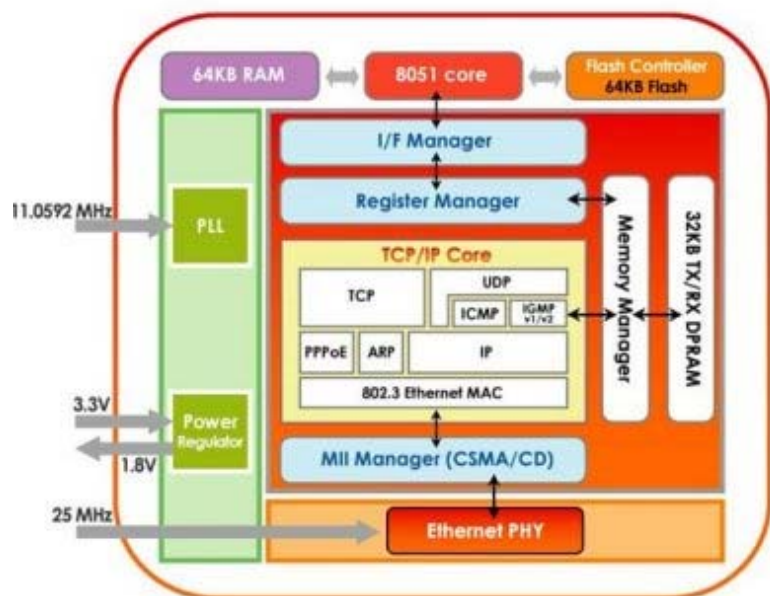


(<http://www.iar.com/website1/1.0.1.0/1483/1/>)

WORKING THE 'NET [\(CIRCUIT CELLAR 151, 2003\)](#)

I've said everything with an electron moving will end up on the 'Net, and that's not far from an exaggeration judging by all the action on the ESC show floor.

WIZnet has announced plans to extend their unique hardware-TCP/IP approach by integrating an 8-bit '51 MCU. This could make a nice platform for applications that need a network connection, but otherwise don't need a lot of processing horsepower. Alternately, the chip could be programmed to serve as a low-cost yet decent performance network "coprocessor" to easily add "offloaded" Internet capability to existing embedded designs.



(<http://www.wiznet.co.kr/en>)

MOXA jumps on the device server (i.e., Ethernet-to-serial) bandwagon with their MiiNePort,

which crams a complete 32-bit computer (ARM7, 4-MB SDRAM, 2-MB flash memory) into an RJ-45 connector.



(<http://www.moxa.com>)

Lantronix takes the computer-in-drag strategy even further now that they've got uClinux running on their stylish MatchPort AR wired and wireless networking modules.



(http://www.lantronix.com/news/PR_09-03-30.html)

Sure wireless sensor networks are all the rage. There's only one problem. Just where in the heck are we supposed to store all the chatter permeating the ether? And who's going to handle all the IT department chores? Digi has an answer in their "iDigi" hosted M2M service-oriented infrastructure, kind of an AOL for the "Internet of Things."

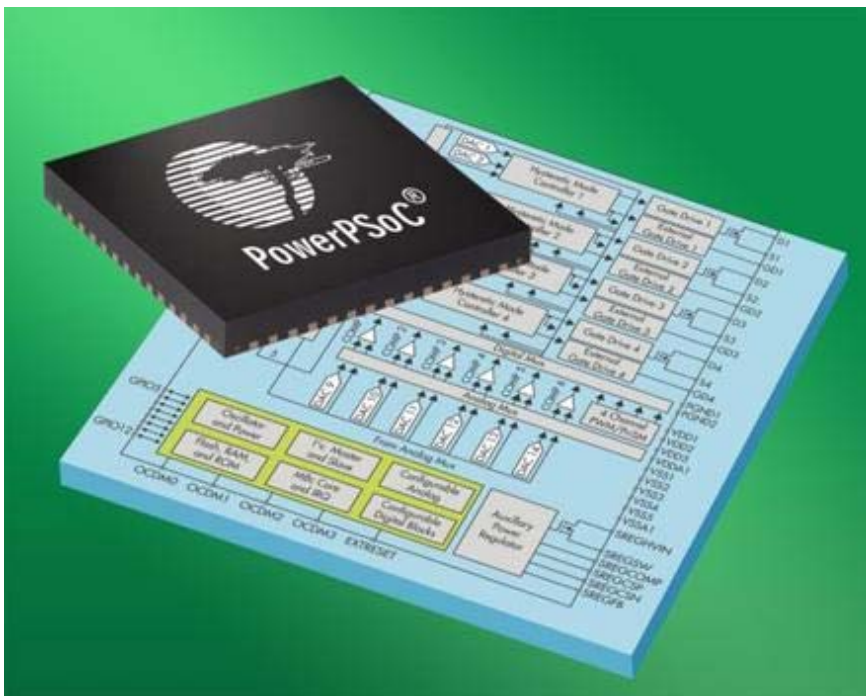


<http://www.idigi.com>

SoC HOP (CIRCUIT CELLAR 128, 2001)

I knew right from the start that the Cypress PSoC's unique combination of MCU and low-cost, easy-to-use programmable logic would be a winner. And it certainly has with Cypress recently celebrating shipment of half a billion units.

These days, when ones-and-zeros are a dime a dozen (million), it's increasingly the analog features that set a chip apart. Enter the PowerPSoC which targets high-voltage/current (up to 32 V/1 A) applications like LED lighting, motor control, and smart switching power supplies with on-chip current controllers, gate drivers, and MOSFETs.



<http://www.cypress.com/?rID=35353>

DISKO BOOGIE (CIRCUIT CELLAR 138, 2002)

Whether in an iPod, netbook, or video camera, solid-state flash disks (aka "SSD") continue to challenge their rotating memory cousins. The same is true on the embedded front with introduction of the "SiliconDrive Blade" by Silicon Systems. It features a robust latching connector from Samtec

that can support a variety of popular interfaces including USB, MMC, SD, and SATA.



(<http://www.siliconsystems.com>)



(<http://www.samtec.com?sbs>)

SSDs won't replace disk drives anytime soon, but inexorably they're taking more share as flash capacity marches onward and upward. The fact that Western Digital just acquired Silicon Systems says it all.

THE LITTLE PROCESSOR THAT COULD (CIRCUIT CELLAR 112, 1999)

As Mark Twain might have put it, "Reports of the demise of the 8-/16-bit MCU market have been greatly exaggerated." Sure, 32-bit MCUs are the next big thing, but it's not a zero sum game, and there will be plenty of sockets for the little guys for a long time. No better testimony than introduction of new 8-bit parts from Infineon and STMicroelectronics.

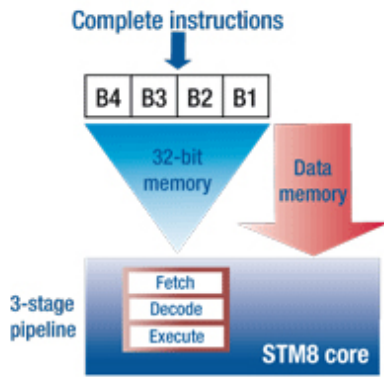


Key Features

- High performance 8051 core
- 4KB up to 64KB Flash
- EEPROM support
- 20-pin up to 64-pin packages
- Flexible PWM unit
- Fast 10-bit ADC
- On-chip OSC
- LIN, CAN connectivity

(<http://www.infineon.com/cms/en/product>)

</channel.html?channel=db3a30431b0626df011b315ce2eb6a27>)



Key features	Benefits
32-bit memory interface and 3-stage pipeline	Key for the performance improvement leads to an average of 1.6 CPI with 20MIPS peak performance
16-bit index register and stack pointer	Better code density and speed when managing tables
16-MBytes linear address space	No overhead for paging operations above 64-Kbytes of memory
Enhanced stack pointer operations	To better support C-programming and real-time operating systems
Advanced addressing modes	Big improvement for supporting C-programming, leading to better code density and efficiency
New instructions	Increased speed of arithmetic operations

<http://www.st.com/mcu/inhtml-pages-stm8.html>)

With something on the order of a million chips shipping every hour of every day, this 8-/16-bit MCU biz is more like selling potato chips than ones made of silicon.

RADIO RIOT (CIRCUIT CELLAR 167, 2004)

As usual, action is hot and heavy on the “embedded wireless” front with yet another round of wireless gadgets (I call ’em “wadgets”) hitting the airwaves. One trend finds products like the Redpine Signals “SensiFi” and ZeroG Wireless “Wi-Fi I/O” putting work boots and a hardhat on Wi-Fi, extending its reach from home and office to the field and factory.



- ✦ Ultra low power 802.11b/g/n Wi-Fi Sensor and RFID support
- ✦ Compliant to 802.11b/g and single stream draft 802.11n
- ✦ Includes all the protocol and configuration functions required for WLAN connectivity in open and WPA/WPA2-PSK secure modes of operation
- ✦ Terminates TCP/IP and UDP connections with IPv6 and IPv4 capability
- ✦ Digital and analog interfaces to external sensors - including temperature, humidity, motion, current, acceleration, and pressure sensors
- ✦ Operates directly off a 2.4 V to 3.6 V battery

<http://www.redpinesignals.com/RS9110-N-11-31.pdf>)



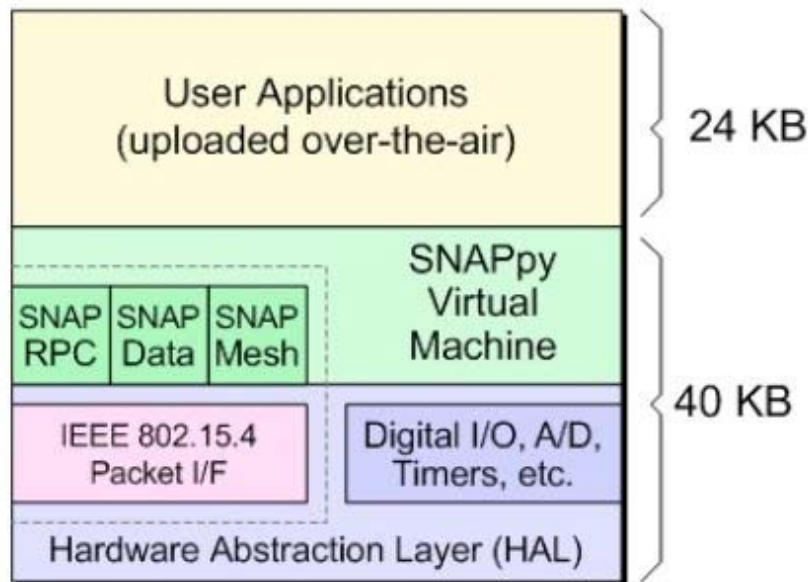
<http://www.zerogwireless.com>

Plenty of action on the 802.15.4 front too. In my in-basket, I've got an impressive looking "MeshConnect Development Kit" from California Eastern Labs (CEL).



<http://www.cel.com/static.do?command=MeshConnect&group=5>

All the radio gear is great, but at ESC it was software I found most intriguing, namely the SNAP (Synapse Network Appliance Protocol) wireless mesh network scheme from Synapse. Software on the nodes is written in a subset of Python that's interpreted by a "SNAPpy" virtual machine, all said to reduce cost and ease development and deployment. Is that snake oil, or is there something to it? Only one way to find out, so stay tuned.



<http://www.synapse-wireless.com/?mainID=3>

PIC UP THE PACE (CIRCUIT CELLAR 110, 1999)

As I mentioned earlier, “Green” is the new black. In the old days all anyone cared about was MIPS and megahertz, but now the first question is how long the battery will last? Rolling out new PICs with “nanoWatt XLP” technology, Microchip says the answer is “a real long time.”



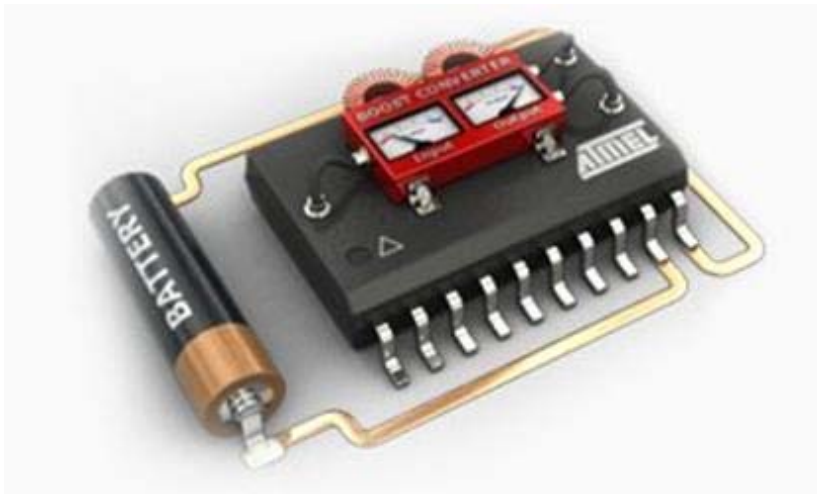
www.microchip.com/stellent/Extreme%20/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=1484

NOT YOUR AVRage MCU (CIRCUIT CELLAR 81, 1997)

Atmel made their own “small is beautiful” waves with two new AVR announcements.

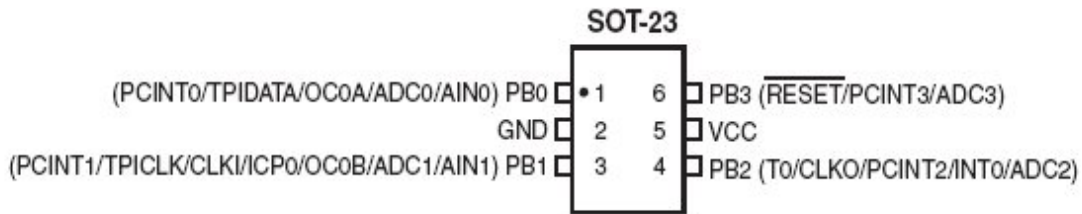
Thanks to an on-chip boost converter, the ATtiny43U is one of the few MCUs on the market capable of running off a single battery cell, all the way down to 0.7 V, while maintaining 3-V I/O

compatibility and performance (up to 8 MIPS).



(http://www.atmel.com/products/avr/attiny43u.asp?family_id=607)

Hope your eyesight is better than mine if you plan to play around with the aptly named TinyAT10 in a miniscule six-pin 3 × 3 mm package. You may have to get out a magnifying glass just to see the thing, but you can put away your wallet since these mini-me MCUs (1-KB flash memory, 32 bytes of SRAM) are just 35 cents each in volume (10,000).



(http://www.atmel.com/dyn/products/product_card.asp?part_id=4558)

ARMed & DANGEROUS (CIRCUIT CELLAR 194, 2006)

ARM continues their march onward and upward in the 32-bit MCU space thanks to licensees that “get it” when it comes to embedded. Luminary continues to impress, now offering a fourth generation of Cortex-M3 Stellaris MCUs that deliver more performance (up to 100 MHz) using less power thanks to 130 nm process and improved power management. Guess I'm not the only one impressed; late-breaking news has Luminary being acquired by TI. (www.luminarymicro.com/press/ti_acquires_luminary_micro.html)

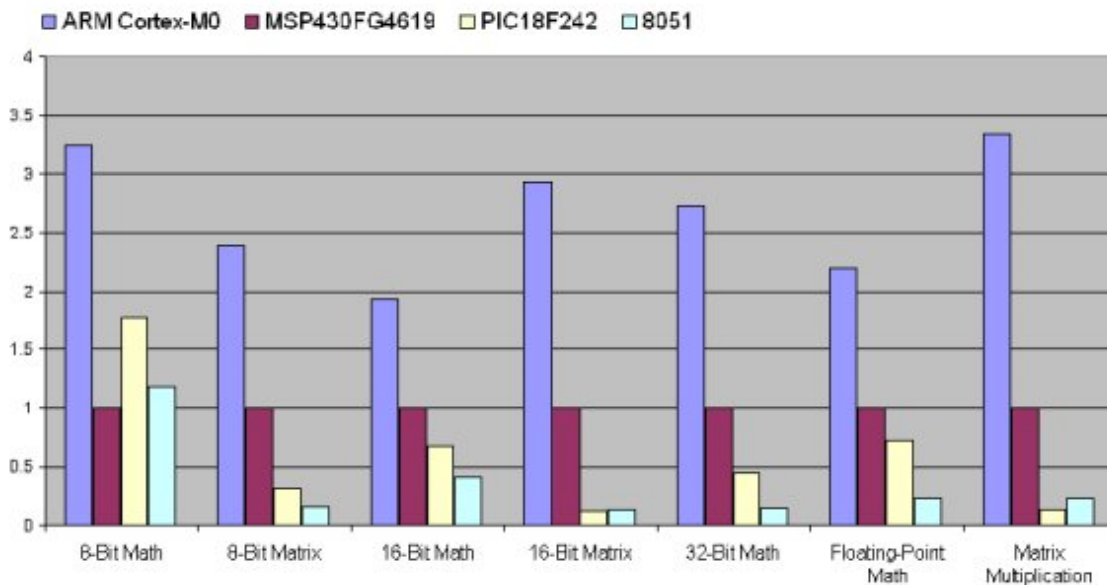


<http://www.luminarymicro.com/products/dk-lm3s9b96.html>

MORE BITS, LESS FILLING (CIRCUIT CELLAR 212, 2008)

Which brings us to the latest chapter in the ARM MCU saga, Cortex-M0. NXP, already a major player in the ARM MCU biz, is charging ahead with 'M0 and has silicon up and running. Actually, *Circuit Cellar* readers have seen Cortex-M0 before, though in a different guise. Architecturally, 'M0 is the same as the 'M1 soft-core running on Actel FPGAs that I covered last year ("Icy Hot," *Circuit Cellar* 217, 2008). The nucleus for both 'M0 and 'M1 is the short and sweet Thumb instruction set (just 56 instructions) that makes for a simpler chip and tight code.

Beyond architecture, the 'M0 story is as much about NXP's lean and mean implementation, which promises to deliver 32-bit performance with 8-/16-bit price and power consumption. NXP says their 'M0-based core is just one-third the size of similarly outfitted 'M3 and consumes a mere 150 mW/MHz. More bits, less filling indeed.



http://www.nxp.com/news/content/file_1546.html

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