TI Concerto dual-core MCU enables green designs

Patrick Mannion - June 15, 2011

To help designers tackle the "evergreen" problem of greater power efficiency, Texas Instruments has announced the C2000 Concerto F28M35x dual-core MCU series that combines its C28x core and control peripherals with an ARM Cortex-M3 core and connectivity peripherals. Together with the company's controlSuite software, the new single-chip C2000 32-bit Concerto MCU series supports real-time control and advanced connectivity in a single 144-pin QFP with a starting price of $7.79 each/10K.

The benefits of improved power efficiency are clear, particularly in the context of motor control and data centers, with 10 billion motors being shipped every year and "Googleplex"-like server farms consuming power in the gigawatts sprouting up globally. Every percentage gain in efficiency translates into many gigawatts-and dollars-saved.

However, according to Keith Ogboenyiya, general manager of TI's microcontroller platform, people talk about the issue solely with respect to power conversion efficiency. Instead, he said, it's now about making devices intelligent, via connectivity: real-time control requires real-time processing. Still, as Ogboenyiya would testify, it's been a bit of a "struggle" with operating systems and connectivity in a real-time domain.

TI dove into connectivity when it announced the F28x MCU line in January. This came with a Viterbi Complex Math Unit (VCU) to efficiently execute communications functions, such as those required for power-line communications. However, if demanding system control, user interface, sequencing, monitoring, and host communications are a requirement, then a separate ARM-based device would be a good idea.

Yet, opting for two devices brings with it added cost, development, board space, and debug issues, as well as inter-processor communication latencies brought about by the 10-Mbit/s limitation of the SPI bus.

It's with these issues in mind that TI has integrated the C28x with the ARM Cortex-M3 to form the F2835x Concerto. Performance can be tailored to different applications with options for 150/75 MHz, 100/100 MHz, or 60/60 MHz on the C28x and Cortex-M3 cores, respectively. As a package deal, the single-chip device reduces complexity, reduces latency to nanoseconds via a shared RAM, and brings with it clear advantages in terms of board space and cost.

In a typical application such as industrial drives and automation, the C28x can handle the variable-speed motor control across multiple motors with precision sensing. Meanwhile, the ARM core takes care of the OS/RTOS, forms the communications bridge (factory-automation protocols such as Fieldbus, EtherCAT, and Profibus are supported) and monitors the motion profiles and overall
system management.

In server farms, the division of labor falls along similar lines, with the C28x taking care of power conversion across multiple rails and loads, driving efficient topologies and ensuring power protection, while the M3 handles load balancing and diagnostics.

The Concerto platform also comes with interesting safety and security features, some coming as a natural result of the integration of the two cores. For example, along with two clocks and multiple system watchdogs, there's functional redundancy, whereby one core can check on the other to ensure accurate execution. Also, two ADCs allow the reliable monitoring of input measurements.

For security, Concerto includes lock protection on GPIO and registers, memory protection for software IP safeguarding, while also allowing the permanent disablement of JTAG for anti-theft protection. Error correction and cyclic redundancy checking are also part of the package.

To bring it all together and ensure fast time to market, TI promises an intuitive software interface using controlSUITE with updated application and communication libraries, with free turnkey application and connectivity software libraries, including Ethernet and USB. Digital power, motor control, and renewable energy libraries will be available in Q3. According to Ogboenyiya, those energy libraries will include solar, with MPPT, dc/dc, and dc/ac.

The MCU is sampling now. To get you started, TI is providing a $139 Concerto Experimenter Kit, with a $99 controlCARD and docking station. An overview of the platform is available [here](#).

Both the MCU and kit have a four-week lead time.