Wearable Medical Devices Benefit from New SoC Solution

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As the “baby boomer” generation ages and generally requires more medical care, the industry is becoming more reliant on alternative measures to treat patients. This - along with an increased interest in fitness and wellness - has necessitated more affordable, portable options. By using portable devices patients can be monitored and treated without the inconvenience of having to frequently visit hospitals and clinics. Examples include hearing aids, activity monitors used as part of a weight reduction management program, medicinal monitors for people requiring ongoing treatment, and transdermal drug distribution patches used as part of pain management therapy.

To meet the growing demand for small, wearable and battery powered devices, ON Semiconductor recently launched Struix™, a new product concept. Meaning “stacked” in Latin, Struix combines a custom ASIC and an application specific standard product (ASSP) microcontroller together in a miniature, high-performance system-on-chip (SoC) solution. The concept offers medical device manufacturers the best of both worlds: the ability to address specific, proprietary sensor-interface needs with a custom chip, while typically lowering design risks and associated costs by using an industry-standard product.

As shown here, the upper chip is an example of a proprietary sensor interface and the lower chip is an industry-standard ARM® Cortex®- M3 controller-based microprocessor (ULPMC10). The ULPMC10 microcontroller is designed specifically with low power and chip stacking in mind. In this example, the two components are stacked in a 6x6mm QFN package, but other packaging options are available.
A Struix-based product begins with the development of a proprietary sensor interface. The development process takes advantage of our intellectual property (IP) within low-power, low-noise signal conditioning, amplification, and conversion. Some examples of available key IP blocks include 24-bit converters operating at less than 2.4pJ per conversion level and low-noise, differential amplifiers operating at only tens of micro amperes.

A proprietary sensor-interface development flow typically originates in the customer’s proprietary sensor interface specification, and is followed by design, implementation, test, and qualification phases. In parallel with these phases, the customer’s application development team is able to develop the necessary end-application code on the ULPMC10 microcontroller. Our development board, which is suitable for standalone operation as well as with a prototype of the proprietary sensor interface once available, enables the customer to evaluate the performance of the end-application prior to full production.

Most medical devices operate in a duty-cycled manner (eg. The devices spend more time in sleep mode than in active mode). The ULPMC10 microcontroller targets such operation by offering a very low sleep mode current of 200nA with real-time clock circuitry always running. Active modes consume less than 200uA/MHz when fully loading the ARM Cortex-M3 processor and executing application code directly out of on-chip flash memory. This allows for extended battery life, which, combined with the usage of smaller batteries, leads to a smaller, more attractive medical device.