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Sensor IC packs 8051 core

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The new SSP1492 chip comes from a fabless company called Sensor Platforms. Founded just last year, it claims to be entirely dedicated to sensor applications. In line with that credo, Sensor Platforms provides a product that promises to reduce sensor application development time, while improving sensor performance.

Linearization and more

As a "smart sensor" conditioner, the SSP1492 gives any sensor the ability for self-identification. But wait. There's more. It can also correct for zero offset and span variation. Correcting for non-linearity is a piece of cake, too, as is correction for cross-sensitivity. The SSP1492 can also handle sensor calibration.

In multi-sensor systems, the SSP1492 should also be worth its salt. That's because combining several sensors together into one measurement device can easily pose a variety of disparate demands on an implementer. According to Sensor Platforms's president George Hsu, this new silicon can cost-effectively address those needs, however.

Just how cost-effectively, you might ask? Well, right now you can get unpackaged SSP1492 die for about $3.50 a pop in 1,000-piece quantities. Depending on packaging you'll have to add about 30-cents to 50-cents more per chip.

When you consider how powerful these sensor conditioners are though, I think you'll agree that that's pretty low cost-especially when you factor-in that writing code for the venerable 8051 microcontroller core is relatively straightforward and is a skill that's widely known.

An industry-standard core

In addition to the 8051, the 3V (5V compliant inputs) power-managed SSP1492 chip integrates its own so-called math engines. It also uses a unique frequency-mode data converter that gives you scalable dynamic range, accuracy, and speed.

The 8051 core is no slouch, by the way. It has the ability to churn through 14MIPS (million instructions/s), as it clocks at a moderate current-sipping 18MHz.

Functions in ROM

The 8051 runs in conjunction with the chip's built-in math engines, with ROM-contained functions supporting trigonometric, polynomial, and general-purpose floating-point math. The 8051 can also execute your own customized subroutines, algorithms, and system control functions.

The two host-accessible math engines perform trig, inverse trig, geometric, long integer and scaled fractional multiply, divide, add and subtraction operations. Significantly, the math engine's architecture slashes code space, and reduces the time required for the 8051 to make its sensor calculations. The system also reduces the amount of SRAM needed to store values during a calculation.

All of this is supported by the IC's non-volatile data constant storage and user program storage space. You can select from four memory programming options: masked ROM, external ROM/flash (in which case the device comes in a larger package), a serial EEPROM upload, or a host-initiated upload. The device's internal ROM also contains some ready-to-use signal processing functions.

Frequency-time conversion
For its part, the SSP1492's data converter is essentially a frequency-time converter. It consists of a sensor oscillator stage (an oscillator modulated by a sensor element's electrical properties), and a period counter. The counter demodulates a sensor signal into a digital value.

These stages work with scalable resolution and conversion time. Interestingly, the maximum resolution is virtually infinite. The sensor oscillator, along with configurable analog switches and the counter capture unit can measure a wide range of resistive, capacitive, inductive, voltage, current, and pulse-mode sensors.

The native resolution of the device's internal registers is 16 bits, and the default ROM contains routines for 32-bit sensor measurements and an averaging filter, along with math tools.

Other on-chip blocks include a user-accessible 2.3V regulator that can also serve as a reference, un-committed registers for user functions, and a high performance op-amp for signal conditioning.

There's also an external clock input if your sensor application requires greater accuracy than that affordable by the chip's RC oscillator function. Finally, you also get eight lines of general purpose I/O that can be configured for digital data or as analog inputs.

Standard serial communications
Like many 8051 cores, the SSP1492 can communicate with a host or peripherals using either the popular Motorola-derived SPI (Serial Peripheral Interconnect) or the Philips I^2C protocols. The SPI interface is configurable for polarity and phase from external pins, and all on-chip functions and internal circuits are controllable from the register-based serial interface.

Sensor Platforms' press release (on the left) also mentioned that USB-communications (Universal Serial Bus) eval kits (priced at about $400) are available for this chip, as well as development system software and analysis software.

Not said is that these tools include a plethora of config files, templates, and example freeware in C. You also get a C compiler and an EEPROM burner. The toolkit also includes some data-acq and control software, as well as system analysis tools. These include spreadsheets and Spice models.

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