Silicon Labs Introduces Single-Chip Relative Humidity Sensor

Compact Si7005 Sensor IC Reduces System Cost and Complexity in Applications That Monitor and Control Humidity and Temperature

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AUSTIN, Texas--(BUSINESS WIRE)--Silicon Laboratories Inc. (NASDAQ: SLAB), a leader in high-performance, analog-intensive, mixed-signal ICs, today introduced a digital relative humidity (RH) and temperature “sensor-on-a-chip” solution. The new Si7005 sensor advances the state of the art in RH sensing by combining a mixed-signal IC manufactured on standard CMOS with a proven technique of measuring humidity using a polymer dielectric film. The Si7005 sensor is ideal for applications that monitor or control humidity and temperature including automotive climate control and defogging, HVAC, refrigeration, weather stations, food processing, printers, asset tracking, and medical instruments such as nebulizers, oxygen concentrators and respiratory therapy equipment.

Traditional approaches to RH sensing use discrete resistive and capacitive sensors, hybrids and multi-chip modules (MCMs). These legacy approaches suffer from high bill of materials (BOM) cost and component count, large footprints, manufacturing challenges and the need for labor-intensive customer calibration. In contrast, the single-chip Si7005 humidity sensor is smaller, more reliable, and much easier to design in and use than traditional discrete/module solutions.

The Si7005 humidity sensor is a “plug-and-play,” factory-calibrated RH and temperature sensing solution. The device’s digital output and factory calibration frees the developer from having to calibrate the sensor and also makes Si7005 sensors completely interchangeable. No software/firmware update or recalibration effort is required to change from one sensing unit to another. The customer spends no time or labor on the manufacturing line adjusting each unit, which eases production, rework and field servicing. The Si7005 sensor’s compact QFN package supports tape-and-reel packaging, automated pick-and-place PCB manufacturing and conventional soldering processes, further helping OEMs reduce manufacturing costs.

The Si7005 sensor uses state-of-the-art sensing technologies to enable precise monolithic humidity and temperature sensing. Temperature is sensed by a precision bandgap referenced circuit on the die. Humidity is sensed by measuring the capacitance change of an industry-standard low-k dielectric layer applied to the surface of the die. Both temperature and humidity are precisely measured in very close proximity on the same monolithic device, providing exceptional measurement accuracy. The Si7005 device is also the lowest power RH sensor of its kind, consuming only 2 µA on average at one measurement per minute, which makes it ideal for battery-powered applications.

The entire BOM for the Si7005 RH sensor solution is just two bypass capacitors versus the dozens of components often required to implement the same functionality with a discrete solution. The Si7005 device integrates sensing elements, an analog-to-digital converter (ADC), signal processing, non-volatile memory for calibration data and an I^2C interface in a monolithic CMOS IC. This high level of single-chip integration makes the sensor rugged and reliable, reduces cost and development time, and simplifies board design.

Silicon Labs has also developed an innovative solution to address the vulnerabilities to damage and contamination encountered by traditional sensors. The Si7005 device is available with an optional, factory-installed, low-profile protective cover that protects the sensor from liquids and particulates before, during and after assembly, and throughout the end product’s entire lifetime. This innovative filter eliminates material and labor costs associated with competing sensor solutions, and it has no impact on measurement sensitivity.

“The Si7005 humidity sensor offers an unmatched combination of ease-of-use, reliability, small size, low power and compatibility with standard manufacturing flows,” said Mark Thompson, vice president and general manager of Silicon Labs’ Access, Power and Sensor products. “The Si7005 is the only single-chip digital humidity/temperature sensor available from a diversified semiconductor supplier. Silicon Labs offers a broad portfolio of complementary mixed-signal IC products, from low-power microcontrollers to wireless transceivers, to enable comprehensive solutions for wireless sensor nodes and other applications for the Internet of Things.”

The Si7005 humidity sensor is the newest member of Silicon Labs’ growing portfolio of sensor products, which includes capacitive touch sensors, proximity and ambient light sensors, MCU-based temperature sensors, isolated ac current sensors and high-side dc current sensors.

Pricing and Availability

Volume production quantities of Silicon Labs' Si7005 humidity and temperature sensor are available now in a 4 mm x 4 mm QFN package. Product pricing for the Si7005 sensor in 10,000-unit quantities begins at $3.64 (USD).

The Si7005USB-DONGLE USB-based evaluation board, priced at $49, simplifies Si7005 sensor evaluation. The Si7005-EVB daughter card, priced at $29, includes a flex-cable that enables developers to evaluate the Si7005 in a temperature or humidity chamber. The Si7005EVB-UDP plug-in card for Silicon Labs' Unified Development Platform is priced at $49. The Si7005EVB-UDP-F960 development kit, priced at $149, combines an ultra-low-power C8051F960 MCU development kit with a UDP daughter card into a portable demonstration platform (no PC required) that includes data logger demonstration code. Software drivers are available for Linux and Android platforms. (All board prices are in USD MSRP.)

For additional Si7005 sensor product information, samples and development tools, please visitwww.silabs.com/humidity-sensor.

Silicon Laboratories Inc.

Silicon Laboratories is an industry leader in the innovation of high-performance, analog-intensive, mixed-signal ICs. Developed by a world-class engineering team with unsurpassed expertise in mixed-signal design, Silicon Labs' diverse portfolio of patented semiconductor solutions offers customers significant advantages in performance, size and power consumption. For more information about Silicon Labs, please visit www.silabs.com.

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