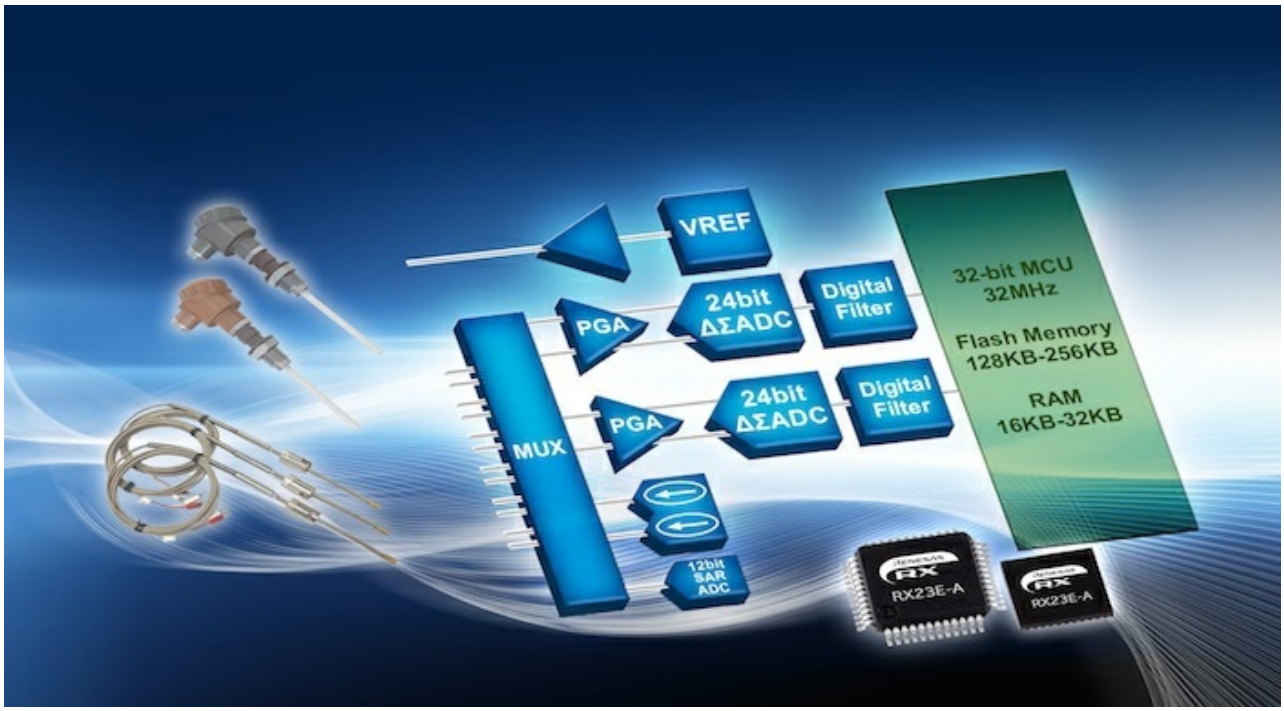
CAN Newsletter Online

MICRO-CONTROLLER

Single-chip with analog front-end

Renesas has introduced the RX23E-A MCU family designed for measurements of analog signals. The precision is better than 0,1 percent without calibration.



The RX23E-A combines an analog front-end with a 32-bit micro-controller providing an on-chip CAN controller (Photo: Renesas)

The launched 32-bit micro-controllers will be available end of 2019. They are suitable for manufacturing, test, and measurement equipment applications that require high-precision measurements of analog signals for temperature, pressure, weight, and flow. The MCUs feature an offset drift of 10 nV/°C, a gain drift of 1 parts per million/°C, and an RMS noise of 30 nV root mean square. In the past, this could previously only be achieved by combining dedicated A/D converter circuits with high-precision operational amplifier ICs (integrated circuits). By integrating the analog front-end (AFE) unit, the Japanese chipmaker has made it possible to implement high-precision sensor measurement, computation, control, and CAN communication on a single chip. This allows system manufactures to reduce the number of required components, save space, and simplify device design. This applies to a wide range of equipment requiring high-precision measurement, such as sensing, temperature controllers, recording, weighing, and force sensing.

“The RX23E-A MCUs will radically evolve the structure of high-precision analog measurement systems,” said Akira Denda from Renesas. “Moving forward, Renesas is aiming to deliver an extensive product line, starting with the RX23E-A Group, that integrates MCUs and high-precision analog on a single chip for programmable logic controllers, distributed control system applications, and test and measurement equipment that require a variety of higher precision measurements.”

The RX23E-A MCUs are based on the RXv2 core, which features operating speeds of 32 MHz, a digital signal processor (DSP), and a floating point unit (FPU). This allows the implementation of adaptive control using temperature data and inverse matrix calculations using 6-axis distortion data. For example, robot arm force sensors require the measurement and calculation of the 6-axis distortion in a small space. The products make it possible to measure the 6-axis distortion data and perform the inverse matrix calculations with a single chip.

The AFE unit comprises two 24-bit delta-sigma A/D converters. They can start synchronously, allowing sensor temperature correction to be performed without switching channels. The on-chip rail-to-rail input of the PGA (programmable gain amplifier) allows amplification of up to 128 times. The voltage reference features a temperature drift of 4 parts per million/°C. There are up to six differential analog input channels and up to eleven pseudo-differential input channels. They all can be used as inputs to the two A/D converters.

The 32-MHz MCU block provides up to 256 KiB ROM and up to 32 KiB RAM. Besides the CAN interface, there are one SPI, four UARTs, and one I^2C. The micro-controller supports functional safety by means of software-based self-diagnostic and disconnection-detection assistance functions for the A/D converter, clock frequency accuracy measurement circuit, independent watchdog timer, RAM test assistance functions using the DOC, and other circuits. The chip requires a 5-V power supply and operates from -40 °C to +105 °C. It comes in a 48-pin QFP (7 mm^2) or 40-pin QFP (6 mm^2) package.

hz