

CAN FD MCU with mathematical accelerators

The STM32G4 MCU's (micro-control unit) by ST combines a 32-bit Arm Cortex-M4 core running at 170 MHz with 3 different hardware accelerators. The CAN FD support will benefit industrial products.



The STM32G4 Series combines a 32-bit Arm Cortex-M4 core (with FPU and DSP instructions) with 3 different hardware accelerators: ART Accelerator, CCM-SRAM routine booster, and mathematical accelerators (Photo: STMicroelectronics)

As the latest smart electronic products add extra sensor-driven features and adopt higher-efficiency power technologies such as silicon carbide or gallium nitride to save energy, STMicroelectronics has unleashed its micro-controllers with the performance to manage them.

Targeted at advanced digital power applications and consumer and industrial appliances, the micro-controllers introduce two hardware mathematical accelerators to boost processing of applications using Cordic and Filtering functions. The product is dedicated to speeding calculations such as trigonometry for energy-saving motor controls in appliances or air conditioners and filtering for signal conditioning or digital power control. This means, the accelerators compute results faster and more efficiently than the general-purpose main processor. This offloading also frees the core to receive more sensor data and control additional user functions.

Further features include higher-resolution power conversion timers with various built-in functions that offload the CPU (central processing unit). There are also analog peripherals and converters, connections for lightning-fast response to external events, and support for the latest USB-C interface with power delivery that allows charging or conveniently powering devices up to 100 W.

“Cutting-edge consumer and industrial products can now deliver more for less, leveraging the innovations we have engineered into the STM32G4 series,” said Ricardo De Sa Earp, General Manager of STMicroelectronics' Micro-controller Division. “Building on the unprecedented concept of the STM32F3 series, which integrates rich, enhanced peripherals and interfaces with the industry-standard Arm core, our latest micro-controllers now extend the application reach and help simplify design at the same time as reducing power consumption and boosting performance.”

According to the company, the MCUs support extra functionality and increase energy efficiency in a range of products addressing smart-living, smart-factory, and smart-energy applications. These range across e-mobility including e-bikes, digital power supplies, advanced motor controls, lighting, building-automation products, and others.

In addition, features such as a scalable securable memory area for secret storage and secure live firmware upgrade, debug-access prevention after programming to reduce threat surfaces, AES-256 encryption, device ID, and true random-number generator (TRNG) empower developers to handle the latest cybersecurity challenges.

More than 100 of the 152 devices ST has planned for this series are already available, from access line devices in 32-pin packages to performance line and high-resolution line MCUs with up to 107 input/output pins.

MCU architecture

The series builds on ST's to ART Accelerator and CCM-SRAM routine booster. These, respectively, enhance dynamic and static memory-cache performance for superior whole-application and real-time performance.

ST's hardware mathematical accelerators up the ante once again, introducing a Filter-Math Accelerator (FMAC) and dedicated Cordic engine. These peripherals deliver results for rotational and vector trigonometry used in: motor control, as well as general logarithmic, hyperbolic, and exponential functions, IIR/FIR filtering for signal conditioning or the 3p/3z controller in digital power supplies, and vector functions such as convolution and correlation. The series is built on a 170 MHz implementation of the Arm Cortex-M4 core, with floating-point unit and DSP extensions, benchmarked at 213 DMIPS and 550 Coremark.

There are also power-saving innovations throughout, from the process technology and architectural features to peripheral sleep/wakeup management. The product also features a timer with 12 independent channels with 184 ps resolution each, self-compensated versus temperature, and voltage drift, up to 25 advanced analog, CAN FD industrial connectivity, offering up to eight times the payload bit rate of Classical CAN, as well as less than 165 μ A/MHz in run mode for longer battery life. Other features are larger on-chip RAM, up to 128 Kbit/s with parity bit, up to 512 Kbit/s Flash memory with error code correction (ECC), increased DMA and external-interrupt flexibility, and digital or analog optimization through access line, performance line, and line MCU variants.

The series thus complements the existing STM32F3 series bringing three times more performance, new devices up to 125 °C ambient temperature grade, dual-bank memories for live firmware upgrade, and package options including LQFP80 and LQFP128. Dedicated discovery kits leveraging the digital-power and motor-control capabilities of the STM32G4 series will come in quarter three of 2019.

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