STMicroelectronics Raises Performance, Efficiency, and Security of Next-Generation Digital Power Applications with STM32G4 Microcontrollers

- *New mathematical accelerators increase speed, save energy*

- *Advanced analog peripherals allow more sensors and user features*

- *Stronger protection enhances cyber security*

Geneva, May 28, 2019 – 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 (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, has unleashed its next generation of microcontrollers with the performance to manage them.

Targeted at advanced digital power applications and consumer and industrial appliances, the new STM32G4* microcontrollers introduce two new hardware mathematical accelerators to boost processing of applications using Cordic[1] and Filtering functions among a range of features to support increased performance and energy efficiency. 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, 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 new features include higher-resolution power conversion timers with various built-in functions that offload the CPU and ease developers' lives. There are also higher-performing analog peripherals and converters, ultra-speed connections for lightning-fast response to external events, and support for the latest USB-C interface with Power Delivery that allows fast charging or conveniently powering devices up to 100W.

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[1] CORDIC – Coordinate Rotation Digital Computer: a computationally efficient algorithm for handling elementary mathematical functions with high accuracy

"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' Microcontroller 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 microcontrollers now extend the application reach and help simplify design at the same time as reducing power consumption and boosting performance."*

With faster compute, greater precision, and increased feature integration, STM32G4 MCUs support extra functionality and increase energy efficiency in a wide 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 many 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, state-of-the-art AES-256 encryption, unique device ID, and true random-number generator (TRNG) empower developers to handle the latest cyber-security 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 fast input/output pins. Prices start from $1.68 (10,000-unit price) for the [STM32G431K6U6](#) with 32Kbyte Flash memory in the 32-pin QFN32 package.

Further technical information:

MCU Architecture

The STM32G4 series builds on existing innovations created by ST to boost performance and efficiency, such as the ART Accelerator™ and CCM-SRAM Routine Booster. These, respectively, enhance dynamic and static memory-cache performance for superior whole-application and real-time performance on an efficient power budget.

ST's new hardware mathematical accelerators up the ante once again, introducing a Filter-Math Accelerator (FMAC) and dedicated CORDIC engine. These new peripherals deliver faster 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 STM32G4 series is built on

a high-speed 170MHz implementation of the Arm Cortex®-M4 core, with floating-point unit and DSP extensions, benchmarked at 213DMIPS and 550 CoreMark®[2].

There are also power-saving innovations throughout, from the advanced process technology and architectural features to advanced peripheral sleep/wakeup management. Further important new features include:

- A high-resolution timer with 12 independent channels with 184ps resolution each, self-compensated versus temperature and voltage drift
- Up to 25 advanced analog peripherals:
  - Up to five 12-bit 4Msample/s analog-to-digital converter (ADC) with hardware oversampling able to achieve 16-bit resolution
  - Up to six high-speed, high gain-bandwidth op-amps with 1% built-in gain
  - Up to seven 12-bit digital-to-analog converters (DAC) 15Msample/s
  - Up to seven comparators with 16.7ns propagation delay
- CAN-FD industrial connectivity, offering up to eight times the payload bit rate of standard CAN
- Less than 165µA/MHz in run mode for longer battery life
- Larger on-chip RAM, up to 128Kbyte with parity bit
- Up to 512Kbyte Flash memory with error code correction (ECC)
- Increased DMA and external-interrupt flexibility
- Digital or analog optimization through Access Line, Performance Line, and High-Resolution Line MCU variants

The new STM32G4 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 new package options including LQFP80 and LQFP128. Robust against disturbances, the STM32G4 is particularly immune against Fast Transient Bursts (FTB), reaching the highest level -- 5, which means practically more than 4kV on the equipment (IEC 61000-4-4).

Ecosystem Extension

To assist development, ST has already extended the STM32 development ecosystem with affordable Nucleo boards (NUCLEO-G474RE and NUCLEO-G431RB) and full-featured evaluation boards (STM32G474E-EVAL and STM32G484E-EVAL with crypto) for STM32G4 MCUs and the STM32CubeG4 software pack. There are also a dedicated Motor Control Nucleo pack (P-NUCLEO-IHM03) and software development kits (X-CUBE-MCSDK v5.4), and the online

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[2] CoreMark: EEMBC industry-standard benchmark rating for embedded CPU cores

motor-control tool, ST-MC-SUITE, that helps users browse the ecosystem to find and organize the resources they need for their projects.

Dedicated discovery kits leveraging the digital-power and motor-control capabilities of the STM32G4 series will come in Q3 2019.

You can also read our blog post on STM32G4 MCUs at https://blog.st.com/stm23g4-mixed-signal-mcu/

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About STMicroelectronics
ST is a global semiconductor leader delivering intelligent and energy-efficient products and solutions that power the electronics at the heart of everyday life. ST's products are found everywhere today, and together with our customers, we are enabling smarter driving and smarter factories, cities and homes, along with the next generation of mobile and Internet of Things devices.

By getting more from technology to get more from life, ST stands for life.augmented.

In 2018, the Company's net revenues were $9.66 billion, serving more than 100,000 customers worldwide. Further information can be found at www.st.com.

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