GigaDevice unveils the GD32V series with RISC-V core, in a brand new 32bit general purpose microcontroller

Adopt the GD32V series 32-bit general purpose MCU and discover the RISC-V development world now!

On 22nd August 2019, GigaDevice Semiconductor, officially launches the world's first open source RISC-V based GD32V series 32-bit general-purpose MCU products. GigaDevice provides a complete tool chain support from MCU chips to software libraries and development boards; therefore, creating a strong RISC-V development ecosystem.

As the first product line of the GD32 MCU family based on the RISC-V core, the new GD32VF103 series RISC-V MCU is designed for mainstream development needs, providing a cost-effective and innovative choice, whilst entering the mainstream market with balanced processing performance and system resources. The new products are available in 14 models, including QFN36, LQFP48, LQFP64 and LQFP100, and are fully compatible with existing GD32 MCUs in software development and pin packaging. This unprecedented and innovative design accelerates the development cycle between GD32's Arm® core and RISC-V core products, making product selection and code porting flexible and simple. The new products are specifically targeted for embedded applications ranging from industrial control, consumer electronics, emerging IOT, edge computing to artificial intelligence and deep learning.

Fully optimized RISC-V processor core

The GD32VF103 MCU series adopts the new Bumblebee processor core based on the open source RISC-V instruction set architecture. It is jointly developed by GigaDevice and China's leading RISC-V processor core IP and solution manufacturer Nuclei System Technology, offering a commercial RISC-V processor core for IoT and ultra-low power applications.

The Bumblebee core uses a 32-bit RISC-V open source instruction set architecture and supports custom instructions to optimize interrupt handling. It is not only equipped with a 64-bit wide real-time timer, but also it can generate timer interrupts defined by the RISC-V standard, with support of dozens of external interrupt sources, while possessing 16 interrupt levels and priorities, interrupt nesting and fast vector interrupts processing mechanism. Furthermore, the low-power management unit can support two-levels of sleep mode. The core supports standard JTAG interfaces and RISC-V debug standards for hardware breakpoints and interactive debugging. Additionally, the Bumblebee core supports the RISC-V standard compilation tool chain, as well as Linux/Windows graphical integrated development environment.

The Bumblebee core is designed with a two-stage variable-length pipeline microarchitecture with a streamlined dynamic branch predictor and instruction prefetch unit, while it incorporates a variety of low-power design methods. The performance and frequency of the traditional architecture three-stage pipeline can be achieved at the cost of the two-stage pipeline, achieving industry-leading energy efficiency and cost advantages.

These features allow the GD32VF103 MCU series to operate at up to 153 DMIPS at the highest frequency and under the CoreMark® test achieves 360 performance points, which shows 15% performance improvement compared to the GD32 Cortex®-M3 core. At the same time, the dynamic power consumption is reduced by 50% and the standby power consumption is reduced by 25%.

GD32VF103 series RISC-V core 32-bit general purpose MCU

**Balanced mainstream products portfolio**

The GD32VF103 series RISC-V MCUs provide a processing frequency of 108MHz, 16KB to 128KB of on-chip flash and 6KB to 32KB of SRAM cache, equipped with the gFlash® patented technology, which supports high-speed core accesses to flash in zero wait time. Moreover, the Bumblebee core includes a single-cycle hardware multiplier, hardware divider and acceleration unit for advanced computing and data processing challenges.

The chip is powered by 2.6V-3.6V and the I/O ports can withstand 5V voltage level. It is equipped with a 16-bit advanced timer supporting three-phase PWM complementary outputs and Hall acquisition interface for vector control. Also, it has up to four 16-bit general-purpose timers, two 16-bit basic timers, and two multi-channel DMA controllers. The newly designed interrupt controller (ECLIC) provides up to 68 external interrupts and can be nested with 16 programmable priority levels to enhance the real-time performance of high-performance control.

Furthermore, the new MCUs have a variety of peripheral resources for a wide range of mainstream applications, including up to 3 USART, 2 UART, 3 SPI, 2 I2C, 2 I2S, 2 CAN2.0B, 1 USB 2.0 FS OTG and an External Bus Expansion Controller (EXMC). Among them, the newly designed I2C interface supports Fast Plus (Fm+) mode with frequencies up to 1 MHz (1Mb/s), which is two times faster than the previous speed. The SPI interface also supports four-wire system and more transmission modes, including the easy expansion to Quad SPI for high-speed NOR Flash accesses. Additionally, the built-in USB 2.0 FS OTG interface provides multiple modes such as Device, HOST, and OTG, while the External bus expansion controller (EXMC) is more convenient to connect to external memory such as NOR Flash and SRAM.

The new product integrates two 12-bit high-speed ADCs with sampling rates up to 2.6MSPS, provides up to 16 reusable channels, supports 16-bit hardware oversampling filtering and resolution configurability and it has two 12 Bit DAC. Up to 80% of GPIOs have a huge variety of optional features and support port remapping, which continues to meet the needs of mainstream development applications with flexible and rich connectivity.
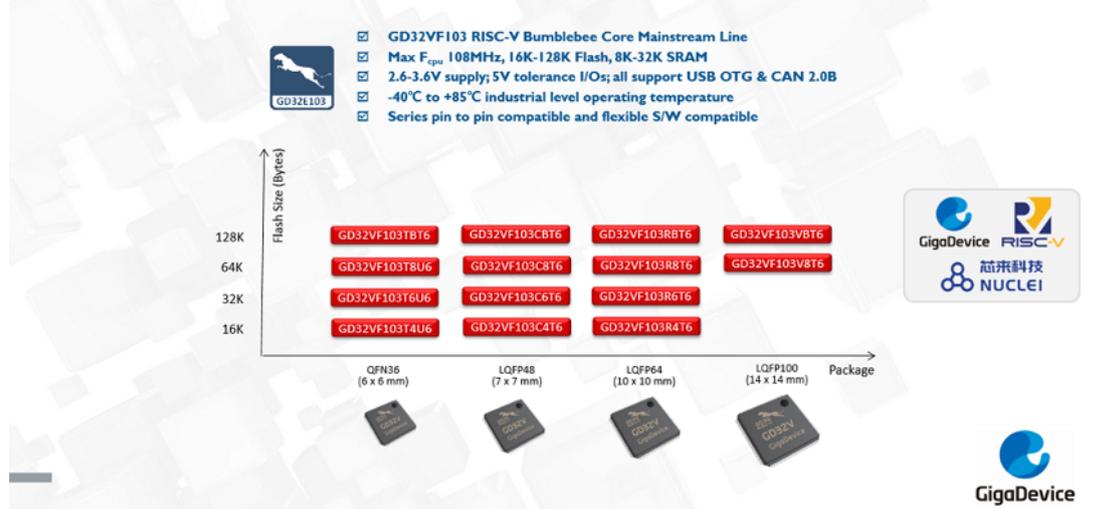
GD32VF103 RISC-V core 32-bit MCU Product Series

Hu Zhenbo, CEO of Nuclei System Technology, said: "GigaDevice is the benchmark for the integrated circuit industry and the prominent supplier for general purpose MCU market in China. Nuclei System Technology currently has the leading RISC-V processor core IP and tool chain capabilities and it is at the forefront of R&D and industrialization of RISC-V embedded processors. The cooperation between the two parties will give RISC-V a strong base, bringing new breakthroughs and forming a new pattern for general-purpose MCUs in the AI and IOT era. We are working together with customers to achieve win-win results."

Deng Yu, executive VP of GigaDevice, general manager of GigaDevice MCU BU, said: "The RISC-V system has globally emerged and become a rapid development trend in the semiconductor industry for applications such as industrial control, Internet of Things, intelligent terminals and others. GigaDevice is the first in the industry to launch 32-bit general-purpose MCU products based on RISC-V architecture and continues to build and strengthen the RISC-V development ecosystem. GigaDevice will further meet the market's differentiated demand for open architecture and cost advantages. We will continuously enrich the GD32 MCU 'department store', providing more innovative choices to our customers."

Continuously built RISC-V development ecosystem

GigaDevice is providing rich and comprehensive support for the GD32 ecosystem, including a variety of development boards and application software for the RISC-V development ecosystem. Users of the GD32V family can easily implement their design ideas with the new development tools and software libraries. These new development tools include the GD32VF103V-EVAL full-featured evaluation board along with the GD32VF103R-START, GD32VF103C-START and GD32VF103T-START entry-level learning boards, each one with a different chip package and number of pins, making it easy for users to develop and debug their projects. In addition, GigaDevice provides the GD32VF103-BLDC motor control development board and GD-LINK debugging mass production tool to more fully integrate the GD32 RISC-V design plan.

GigaDevice also cooperates with Nuclei System Technology to provide Nuclei Studio, a free integrated development environment for GD32V MCU series. This new IDE is based on the open source Eclipse environment and integrates RISC-V related tools such as GCC and OpenOCD. With Nuclei Studio, users can quickly get started and complete a series of development processes such as code writing, cross-compilation, online debugging, and programming. Third-party partners also offer more IDE and tool options, including Huawei IoT Studio, SEGGER J-Link V10 and Embedded Studio. Embedded operating systems including µC/OS II, FreeRTOS, RT-Thread, and Huawei LiteOS are also fully integrated and can provide connectivity with the cloud. All of these tools have greatly simplified the development of the RISC-V based MCUs.

Start the development experience of RISC-V now!

The new GD32V series meets industrial grade high reliability and temperature standards, offering a continuous supply guarantee of at least ten years. The chip's electrostatic discharge (ESD) protection level can reach 5KV in human body discharge (HBM) mode and 2KV in device discharge mode (CDM), which are much higher than industry safety standards, making the chips suitable for more harsh environments. As a result, the end products are more reliable and durable.

The new GD32VF103 series RISC-V MCU samples and development tools are now available. For more information, please contact your local GigaDevice Sales Office and authorized representatives, or visit the product website www.gigadevice.com.

About GD32 MCU

GigaDevice GD32 MCU is a leader in China's high-performance 32-bit general-purpose microcontroller market being the first to release China's Arm® Cortex®-M3, Cortex®-M4, Cortex®-M23 and RISC-V core MCU product series. With over 300 million units shipped, more than 20,000 customers and 23 series of product lines with exceeding 330 part numbers for selection, GigaDevice can provide solutions for a broad set of applications in the embedded market. GigaDevice GD32 MCU is also the first Chinese Arm® University Program (AUP) partner, an Arm® mbed™ IoT platform eco-partner, RISC-V Foundation Silver Member and the title sponsor of the "GigaDevice Cup" in China Graduate Electronic Design Contest. All models are compatible with each other in terms of software with scalable lines of hardware pin packages. They are fully applicable to all kinds of high-performance, mainstream and entry-level embedded control requirements; enabling cost-effective value while providing a comprehensive ecosystem and ease of use. With all this capability, these products have become the popular choice for system designs and product development.

About Nuclei System Technology

Nuclei System Technology is a leading RISC-V processor core IP and solution company, which continues to focus on RISC-V processor core development and empowers the local RISC-V industry ecosystem. Nuclei Systems Technology's embedded CPU core series possesses high performance, low power consumption and ease of use characteristics. Furthermore, the embedded CPU core series has advantages in performance, area, power consumption, maturity, price and development platform, being the forefront of RISC-V embedded processors in R&D and industrialization. Nuclei System Technology is currently a silver member of the RISC-V Foundation, a vice president of China RISC-V Industry Consortium (CRVIC) Department, and a member of the China RISC-V Alliance Department.

About GigaDevice

GigaDevice Semiconductor, founded in Silicon Valley in April 2005, is a global fabless semiconductor company engaged in advanced memory technology and microcontroller products. GigaDevice is among the companies that pioneered SPI NOR Flash memory and is currently one of the top three suppliers in the world with an annual shipment of more than 1 billion units. It is committed to the success of our customers through continuous innovation, in-depth research, quality design, and development. The company has global branch offices located in China, Taiwan, Korea, Japan, Singapore, United States and

United Kingdom. GigaDevice management system has achieved ISO 9001:2015 and ISO 14001:2015 certification. The company is publicly trading on the Shanghai Stock Exchange since August 2016. For more information, please visit www.gigadevice.com.