

## HPM5E00 Series

High-Performance EtherCAT Motion Control MCU

A high-performance, real-time Ethernet-capable microcontroller based on RISC-V core. Integrated EtherCAT Slave Controller, Gigabit Ethernet port, 16-channel high-resolution PWM outputs,  $\Sigma\Delta$  digital filter, High-precision motion control system. Industrial automation solutions including: High/low-voltage servo drives, Stepper motor servo systems, Remote I/O modules, Sensor interfaces, Communication modules.



**Smaller package**



**Lower power**



**Lower cost**

### Performance

- RISC-V with double-precision floating-point and DSP extensions, operating at 480MHz, delivering 2712 CoreMark™ and 1368 DMIPS.
- 32KB high-speed cache (I/D Cache) + 256KB zero-wait-state instruction/data local memory (ILM/DLM), plus 256KB general-purpose SRAM, minimizing performance loss from slow external memory.

### Real-Time Ethernet System

- EtherCAT Slave Controller supporting up to 3 ports.
- 1000Mbps Ethernet MAC controller.

### Enhanced Motion Control System

- Two 8-channel enhanced PWM controllers with 100ps modulation precision.
- Motion sensor interfaces: Incremental position sensor and magnetic encoder interfaces.
- Pulse-based position output interface.
- Programmable Logic Block (PLB).

### Memory & Expansion Interfaces

- 1MB embedded Flash
- Programmable parallel bus for external devices expansion (supports FPGA and other peripherals).

### Power System

- Integrated high-efficiency DCDC converters and LDOs, supporting single power supply operation with dynamic voltage scaling for performance-power balance. Combines flexibility, ease of use, and efficiency.
- Multi-power-domain design supporting various low-power modes.
- Ultra-low-power standby.

### Peripherals

- Communication interfaces: 1x high-speed USB with integrated PHY, Up to 4x CAN/CAN-FD, Multiple UART, SPI, and I<sup>2</sup>C peripherals.
- $\Sigma\Delta$  demodulator: Includes SINC digital filter, Supports external  $\Sigma\Delta$  modulator.
- 2x 16-bit high-precision ADCs (2MSPS, configurable as 12-bit at 4MSPS) with up to 16 analog input channels, 2x analog comparators.
- Up to 20x 32-bit timers, 3x watchdog timers.

### Security

- Lifecycle-based security management with multiple tamper detection mechanisms for sensitive data protection.
- Built-in BootROM supporting secure firmware download/upgrade via USB or UART.



**HPMicro**

**High-Performance**

**Microcontroller And Solutions Provider**

Scan the QR code for more information.



HPM 5E00 Series

A 32-bit high-performance microcontroller based on RISC-V core

Parameter	HPM5E31	HPM5E11
CPU0	480MHz	
On-Chip SRAM	512KB	
On-Chip Flash	1MB	
ESC	3 ports	
Security	Real-time encrypted execution, AES/SHA, TRNG, Secure Boot	
USB	1x High-Speed USB (with PHY)	
CAN FD	4	
UART/SPI/I <sup>2</sup> C	9x/4x/4x	
PWM	2x8CH 100ps HR PWM	/
Timers	9x GPTMR (4x 32-bit each)	
Position Sensor	2-axis incremental I/O	/
ADC	2x16b/2Msps (12b/4Msps) ADC	
ΣΔ Digital Filter	1x4CH	
Analog	2xACMP	
Package	196BGA, 100eLQFP	
Temp. Range	−40~105°C <sub>Ta</sub>	

<div>Power Management</div> <div>DCDC</div> <div>LDOPMC</div> <div>LDOTPT</div> <div>POR/BOR</div>	<div>Core</div> <div>RISC-V CPU 0</div> <div>32KB L1-I</div> <div>32KB L1-D</div> <div>FPU</div> <div>DSP</div> <div>PLIC</div> <div>128KB ILM</div> <div>128KB DLM</div>	<div>Communication Interfaces</div> <div>UART ×9</div> <div>SPI ×4</div> <div>I<sup>2</sup>C ×4</div> <div>CAN FD ×4</div> <div>USB HS ×1</div>
<div>Clock System</div> <div>Fractional-N PLL ×3</div> <div>OSC 24MHz</div> <div>IRC 24MHz</div> <div>IRC 32kHz</div>	<div>Real-Time Ethernet</div> <div>EtherCAT Slave Controller ×3 ports</div> <div>ENET 1000/100/10Mbps ×1</div>	<div>Motion Control System</div> <div>PWM 16CH (8 pairs)</div> <div>Quadrature Input ×2</div> <div>Quadrature Output ×2</div> <div>Programmable Logic</div> <div>Trigger Interconnect</div>
<div>System</div> <div>DMA ×2</div> <div>MBX</div> <div>WDG ×3</div> <div>JTAG Debug</div>	<div>Analog</div> <div>16b SAR-ADC 2Msps ×2</div> <div>ΣΔ filter 4CH ×1</div> <div>Analog Comparator ×2</div> <div>Temperature Sensor</div>	<div>Timers</div> <div>32-bit General-Purpose Timer ×5</div>
<div>Internal Memory</div> <div>Flash 1MB</div> <div>SRAM 256KB + 32KB</div> <div>OTP 4Kb</div> <div>ROM 128KB</div>	<div>External Memory</div> <div>4b/8b Serial NOR/PSRAM ×1</div> <div>Parallel Bus</div>	<div>Security</div> <div>EXIP Online Decryption</div> <div>Secure Debug</div> <div>Product Lifecycle Management</div> <div>Secure Boot</div>
<div>I/O</div> <div>GPIO/Fast GPIO</div>		

Software & Support

HPMicro Semiconductor provides a BSD-licensed SDK, including low-level drivers, middleware, and RTOS components (e.g., lwIP, TinyUSB, FreeRTOS). The SDK is integrated with active open-source projects such as RT-Thread and Zephyr.

SDK Online Documentation

[https://hpm-sdk-zh.readthedocs.io/zh\\_CN/latest](https://hpm-sdk-zh.readthedocs.io/zh_CN/latest)

SDK GitHub Repository

[https://github.com/hpmicro/hpm\\_sdk](https://github.com/hpmicro/hpm_sdk)

SDK Gitee Repository

[https://gitee.com/hpmicro/hpm\\_sdk](https://gitee.com/hpmicro/hpm_sdk)

HPM\_APPS

<https://www.hpmicro.com/design-resources/development-software/20>