GD32, local MCU market leader in China

- China local biggest Arm® MCU Family
- China 1st Cortex®-M3/M4/M23/M33 MCU
- World 1st RISC-V 32-bit general-purpose MCU
- China No.1 local 32-bit MCU Supplier
- MCU annual shipment > 100,000,000 ea
- MCU > 10 years longevity guarantee
## China MCU Business and Ranking

### 2018 China Cortex-M Market Share Estimation

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STMicroelectronics</td>
<td>47.4%</td>
</tr>
<tr>
<td>2</td>
<td>NXP</td>
<td>25.2%</td>
</tr>
<tr>
<td>3</td>
<td>GigaDevice</td>
<td>9.4%</td>
</tr>
<tr>
<td>4</td>
<td>Nuvoton</td>
<td>5.1%</td>
</tr>
<tr>
<td>5</td>
<td>Atmel</td>
<td>2.0%</td>
</tr>
<tr>
<td>6</td>
<td>Infineon</td>
<td>1.7%</td>
</tr>
<tr>
<td>7</td>
<td>Silicon-lab</td>
<td>1.5%</td>
</tr>
<tr>
<td>8</td>
<td>Texas Instruments</td>
<td>1.3%</td>
</tr>
<tr>
<td>9</td>
<td>Spansion</td>
<td>1.1%</td>
</tr>
<tr>
<td>10</td>
<td>Others</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

*Source: IHS Markit, Mar. 2019*
Yearly Shipped Quantities

- GD32 32-bit Arm Cortex® MCU shipment has grown rapidly since the introduction in 2013.
- 2019 is still a record-breaking year for MCU to keep high increasing speed.
Special landmark for GD32

- Apr. 16, 2013: Born in Beijing
- May 2017: 100,000,000ea
- Jun. 2018: 200,000,000ea
- Jul. 2019: 300,000,000ea
- May 2020: 400,000,000ea
GD32 MCU Introduction

With GigaDevice rich memory and controller IC design experiences...

- 2005 – SRAM
- 2008 – SPI NOR Flash
- 2013 – 32-bit Cortex®-M3 MCU
- 2016 – 32-bit Cortex®-M4 MCU
- 2018 – 32-bit Cortex®-M23 MCU
- 2020 – 32-bit Cortex®-M33 MCU

All the No.1 Product in mainland China

GD32 Family of 32-bit ARM® MCUs
- Latest 32-bit ARM® Cortex®-M core
- 24 complete product lines
- >360 P/Ns for selection
- Excellent performance & real-time response
- Optimized active power consumption
- Outstanding ESD & EMC level
- Rich peripherals & interface combination
- Comprehensive IDE & software compatible
GD32 MCU Product Trend

- Standard ARM® Cortex®-M core
- Optimized RISC-V Core
- Multiple integrated peripherals
- Complete product lines for selection
- IDE & software compatible

All Series Compatible

- Scalable architecture
- Fit for simple to complex application
- Same development experiences
- Consolidated development costs

- Leading high performance
- Ultra low power
- Advanced analog functions
- Cost-effective

GigaDevice
# GD32 MCU Family

<table>
<thead>
<tr>
<th>Type</th>
<th>Arm® Cortex®-M 32-bit MCUs (Flash KB/RAM KB)</th>
<th>RISC-V MCUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cortex®-M23</td>
<td>GD32F205 120MHz, 3M/256K</td>
<td></td>
</tr>
<tr>
<td>Cortex®-M3</td>
<td>GD32F207 120MHz, 3M/256K</td>
<td></td>
</tr>
<tr>
<td>Cortex®-M4</td>
<td>GD32F450 200MHz, 3M/512K</td>
<td>GD32E505 180MHz, 512K/128K</td>
</tr>
<tr>
<td>Cortex®-M33</td>
<td>GD32F405 168MHz, 3M/192K</td>
<td>GD32F407 168MHz, 3M/192K</td>
</tr>
<tr>
<td></td>
<td>GD32F403 168MHz, 3M/128K</td>
<td>GD32E503 180MHz, 512K/128K</td>
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<tr>
<td></td>
<td>GD32F507 180MHz, 512K/128K</td>
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<tr>
<td>High-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>GD32F105 108MHz, 1M/96K</td>
<td>GD32F103 120MHz, 128K/32K</td>
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<tr>
<td>Main-</td>
<td>GD32F107 108MHz, 1M/96K</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>GD32F305 120MHz, 1M/96K</td>
<td></td>
</tr>
<tr>
<td>Main-</td>
<td>GD32F307 120MHz, 1M/96K</td>
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<tr>
<td>Performance</td>
<td>GD32F303 120MHz, 3M/96K</td>
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<tr>
<td>Main-</td>
<td>GD32E103 120MHz, 128K/32K</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Entry-Level</td>
<td>GD32E232 72MHz, 64K/8K</td>
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<tr>
<td>GD32E231</td>
<td>72MHz, 64K/8K</td>
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</tr>
<tr>
<td>GD32F170</td>
<td>48MHz, 64K/8K</td>
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</tr>
<tr>
<td>GD32F190</td>
<td>72MHz, 64K/8K</td>
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</tr>
<tr>
<td>GD32F130</td>
<td>48MHz, 64K/8K</td>
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<tr>
<td>GD32F150</td>
<td>72MHz, 64K/8K</td>
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<tr>
<td>GD32F330</td>
<td>84MHz, 128K/16K</td>
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<tr>
<td>GD32F350</td>
<td>108MHz, 128K/16K</td>
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<tr>
<td>Specific</td>
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</tr>
<tr>
<td>Specific</td>
<td>GD32FFPR 168MHz, 1M/128K</td>
<td>GD32EPRT 168MHz, 512K/96K+4M</td>
</tr>
</tbody>
</table>

27 series >360 P/Ns

GigaDevice
GD32 Cortex®-M3 Portfolios ~200P/N

<table>
<thead>
<tr>
<th>Value</th>
<th>Mainstream</th>
<th>High Performance</th>
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<tbody>
<tr>
<td>GD32F130</td>
<td>GD32F103</td>
<td>GD32F203</td>
</tr>
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<td>GD32F150</td>
<td>GD32F105</td>
<td>GD32F207</td>
</tr>
<tr>
<td>GD32F190</td>
<td>GD32F107</td>
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</tr>
<tr>
<td>Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>110</td>
<td>150</td>
</tr>
<tr>
<td>74</td>
<td>110</td>
<td>150 DMIPS</td>
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<tr>
<td>72</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>108</td>
<td>120</td>
</tr>
<tr>
<td>72</td>
<td>108</td>
<td>120MHz</td>
</tr>
<tr>
<td>48</td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

GigaDevice
GD32 Cortex®-M4 Portfolios ~100P/N

Value - GD32F3
- GD32F330
- GD32F350

Mainstream - GD32F3
- GD32F303
- GD32F305
- GD32F307

High Performance - GD32F4
- GD32F403
- GD32F405
- GD32F407
- GD32F450

DMIPS: 210

200MHz
GD32E23x Cortex®-M23 Value Portfolios

- GD32E230 & GD32E231 & GD32E232 Arm® Cortex®-M23 value line @ 72MHz
- 16K-64K Flash, 4K-8K SRAM
- 1.8-3.6V supply; 5V tolerance I/Os
- -40°C to +105°C industrial level operating temperature
- Series pin to pin compatible and flexible S/W compatible
GD32E50x Cortex®-M33 Portfolios

- GD32E503/505/507/PRT high-performance line
- Cortex®-M33 @180MHz
- 128-512KB eFlash, 80-128KB SRAM
- 1.7-3.6V supply; 5V tolerance I/Os
- -40°C to +85°C industrial level operating temperature
- Series pin to pin compatible and flexible S/W compatible

Application Market
- High precision industrial control
- Switching mode power supply
- Motor control
- Frequency conversion
- Measuring instrument
- Mix-signal processing
- High-end consumer electronics
GD32E50x Product Features

- Arm® Cortex®-M33 @180MHz

- Memory
  - Up to 512KB Embedded Flash
  - Up to 128KB SRAM

- Timers
  - High-resolution PWM Generator
  - 2x Advanced TM 16bit
  - 1x GPTM 32-bit, 9x GPTM 16-bit
  - 2x Basic TM 16-bit,
  - 1x Systick TM 24-bit
  - 2x WDG, 1x RTC

- Best-in-class peripheral support
  - 6x USART, 3x I2C, 3x SPI,
  - 2x I2S
  - USB High Speed (480Mb/s)
  - 1x SDIO, 1x Ethernet,
  - 3x Comparator

- Analog Peripheral
  - 3 x 12-bit ADC (16 Channels)
  - 2 x 12-bit DAC

- External Memory support
  - SRAM, PSRAM, ROM
  - NOR Flash, 8/16-bit NAND Flash
  - 16-bit PC Card

- 1.71V - 3.6V power supply

- Up to 112 GPIOs

- Five low power consumption modes;
  - Sleep, Deep Sleep, Deep Sleep 1
  - Deep Sleep 2, Standby

- LQFP48/LQFP64
  - LQFP100/LQFP144 Package
GD32E50x New Peripherals & Accelerators

Hardware Accelerators
- Built-in hardware multiplier/divider + DSP instruction set + FPU
- Trigonometric math unit (TMU)

New peripherals enhance connectivity
- USB2.0 OTG HS/FS PHY + PLL
- SQPI interface expands external storage
- Integrated PSRAM cache (GD32EPRT series)

Super High-resolution Timer
- Multiple high-precision PWM output
- Highest resolution 90ps

Excellent mixed signal integration
- Advanced ADC with fully differential input
- 3x Ultra-fast comparators (delay time 22ns)
- Conjunction with high-resolution timers

Industrial application model
- Clock spread technology reduces EMI
- High noise immunity: ESD 6KV
RISC-V Products
GD32VF103 RISC-V MCU Features

- 108MHz 32-bit RISC-V Core
- Hardware multiplier/divider
- Flash up to 128KB
- SRAM up to 32KB
- Power Supply: 2.6V-3.6V
- SPI/UART/I2C/CAN 2.0B
- USB 2.0 FS OTG
- High-precision 2.6M SPS ADC + DAC
- Various low power modes
- Standby @ 3uA
- Package: LQFP48/64/100, QFN36
GD32VF103 RISC-V Mainstream Portfolios

- GD32VF103 RISC-V Bumblebee Core Mainstream Line
- Max $F_{cpu}$ 108MHz, 16K-128K Flash, 8K-32K SRAM
- 2.6-3.6V supply; 5V tolerance I/Os; all support USB OTG & CAN 2.0B
- -40°C to +85°C industrial level operating temperature
- Series pin to pin compatible and flexible S/W compatible

![Flash Size (Bytes)]

- 128K: GD32VF103TB6, GD32VF103CTB6, GD32VF103RT6, GD32VF103VT6
- 64K: GD32VF103TB6, GD32VF103CTB6, GD32VF103RT6, GD32VF103VT6
- 32K: GD32VF103TB6, GD32VF103CTB6, GD32VF103RT6, GD32VF103VT6
- 16K: GD32VF103TB6, GD32VF103CTB6, GD32VF103RT6, GD32VF103VT6

![Package]

- QFN36 (6 x 6 mm)
- LQFP48 (7 x 7 mm)
- LQFP64 (10 x 10 mm)
- LQFP100 (14 x 14 mm)
RISC-V Development Platform READY

Software Library
GD32V Library

IDE
Nuclei Studio
IoT Studio
SEGGER Embedded Studio
IAR Embedded Workbench for RISC-V

Program & Debug Tool
GD-Link
SEGGER J-Link V10
IAR I-Jet

Embedded OS
μC/OS II
FreeRTOS
RT-Thread
TencentOS Tiny
OneOS

Cloud Link
AWS
Alibaba Cloud
SEGGER announces full support for the first commercially available flash-based RISC-V microcontroller introduced by GigaDevice Semiconductor Inc.

This support includes SEGGER’s Embedded Studio integrated development environment for RISC-V, its market-leading J-Link debug probe, Ozone debugger, SEGGER’s emPack with the RTOS embOS and Software Libraries in the fields of communication, data storage, compression and IoT, as well as the portfolio of Flasher production programmers.
RISC-V Development Platform – IAR Systems

IAR GD32V Evaluation Kit
1. IAR RISC-V GD32V EVAL BOARD
2. I-jet Lite debug probe
3. IAR EWRISCV for RISC-V 30-day evaluation license
4. IAR Academy On-Demand course introduction to RISC-V Evaluation Kit

IAR provides an evaluation kit free of charge to companies with commercially viable development projects.

IAR Embedded Workbench For RISC-V Ver 1.30 Support GD32V MCU

Free online video for the IDE and Evaluation Kit are available on YouTube, WeChat and other online platforms.
Future Products
MCU Focus Application

Ultra Low Power
- Battery supply
- Portable application
- Wearable device

Wireless Connection
- WiFi
- BT 5.x / BLE Audio
- Sub 1GHz
- LPWAN/NB-IoT

Automotive
- Automotive level (AEC-Q100/TS16949)
- Car body & ECU
- Navigation & Infotainment

GigaDevice
Thank You!