



**GigaDevice**

# **GigaDevice GD32 MCU Overview**

**January 2021**

# GD32, local MCU market leader in China



China local biggest Arm® MCU Family

China 1st Cortex® -M3/M4/M23/M33 MCU

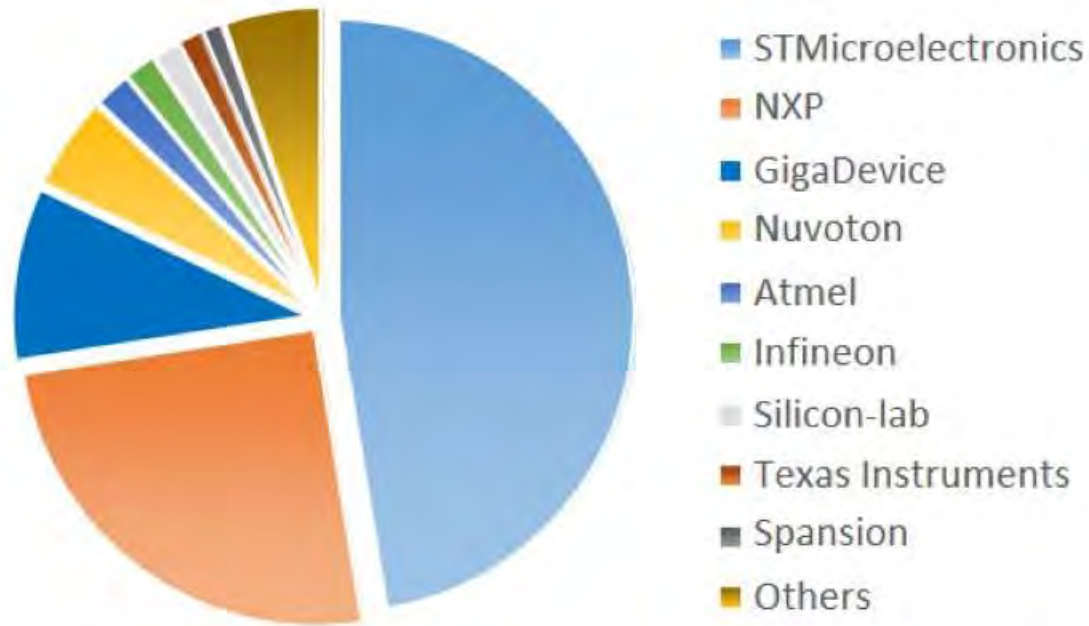
World 1st RISC-V 32-bit general-purpose MCU

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 MCU Market Share Estimation (Based on Bill to China)  
Source: IHS Markit, Mar. 2019

## 2018 China Cortex-M Market Share Estimation

|    |                    |       |
|----|--------------------|-------|
| 1  | STMicroelectronics | 47.4% |
| 2  | NXP                | 25.2% |
| 3  | GigaDevice         | 9.4%  |
| 4  | Nuvoton            | 5.1%  |
| 5  | Atmel              | 2.0%  |
| 6  | Infineon           | 1.7%  |
| 7  | Silicon-lab        | 1.5%  |
| 8  | Texas Instruments  | 1.3%  |
| 9  | Spansion           | 1.1%  |
| 10 | Others             | 5.3%  |

# 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<sup>®</sup>-M3 MCU
- 2016 – 32-bit Cortex<sup>®</sup>-M4 MCU
- 2018 – 32-bit Cortex<sup>®</sup>-M23 MCU
- 2020 – 32-bit Cortex<sup>®</sup>-M33 MCU

All the No.1 Product  
in mainland China



## GD32 Family of 32-bit ARM<sup>®</sup>MCUs

- Latest 32-bit ARM<sup>®</sup>Cortex<sup>®</sup>-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



- High performance
- Cost-effective
- Easy use



# 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



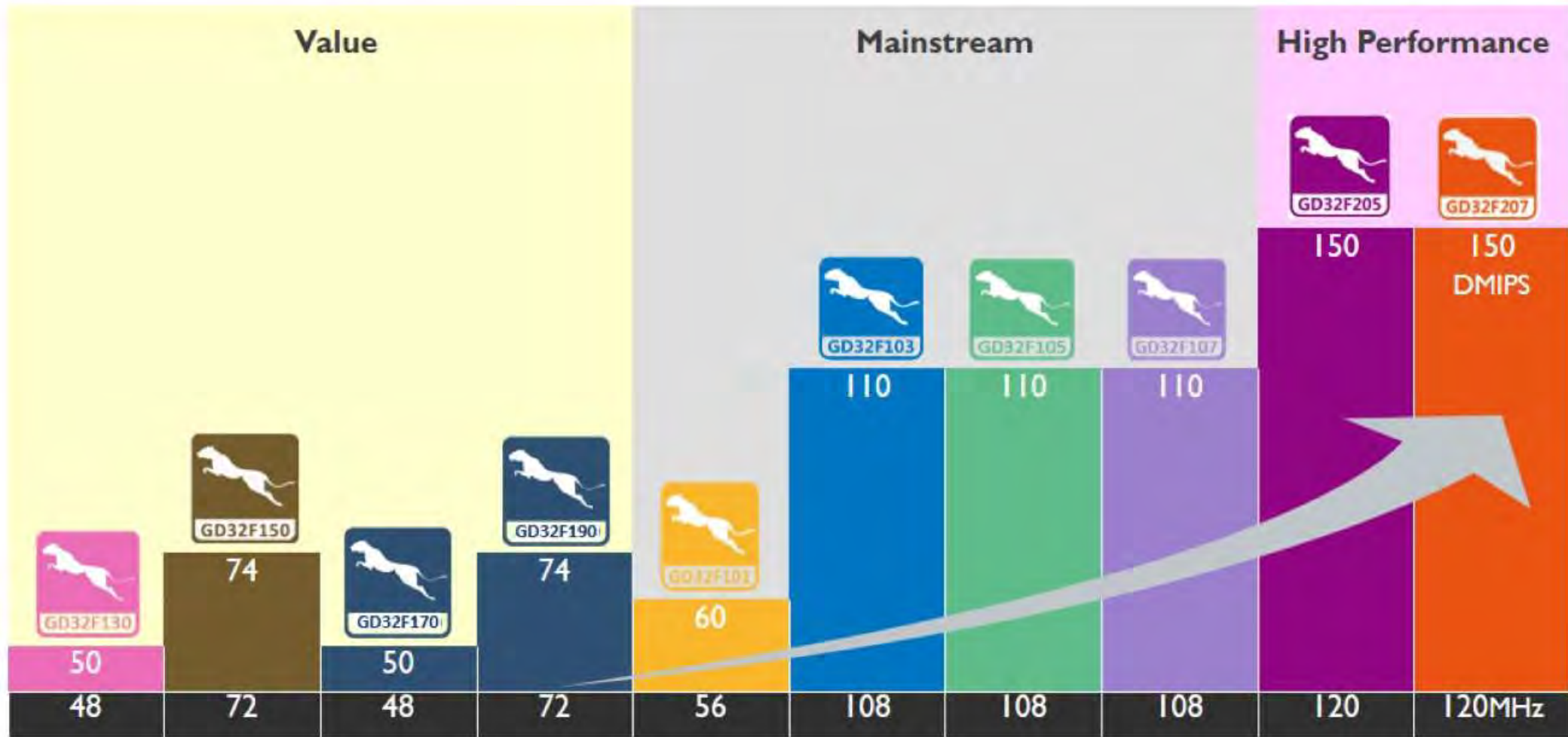
# Arm<sup>®</sup> Products



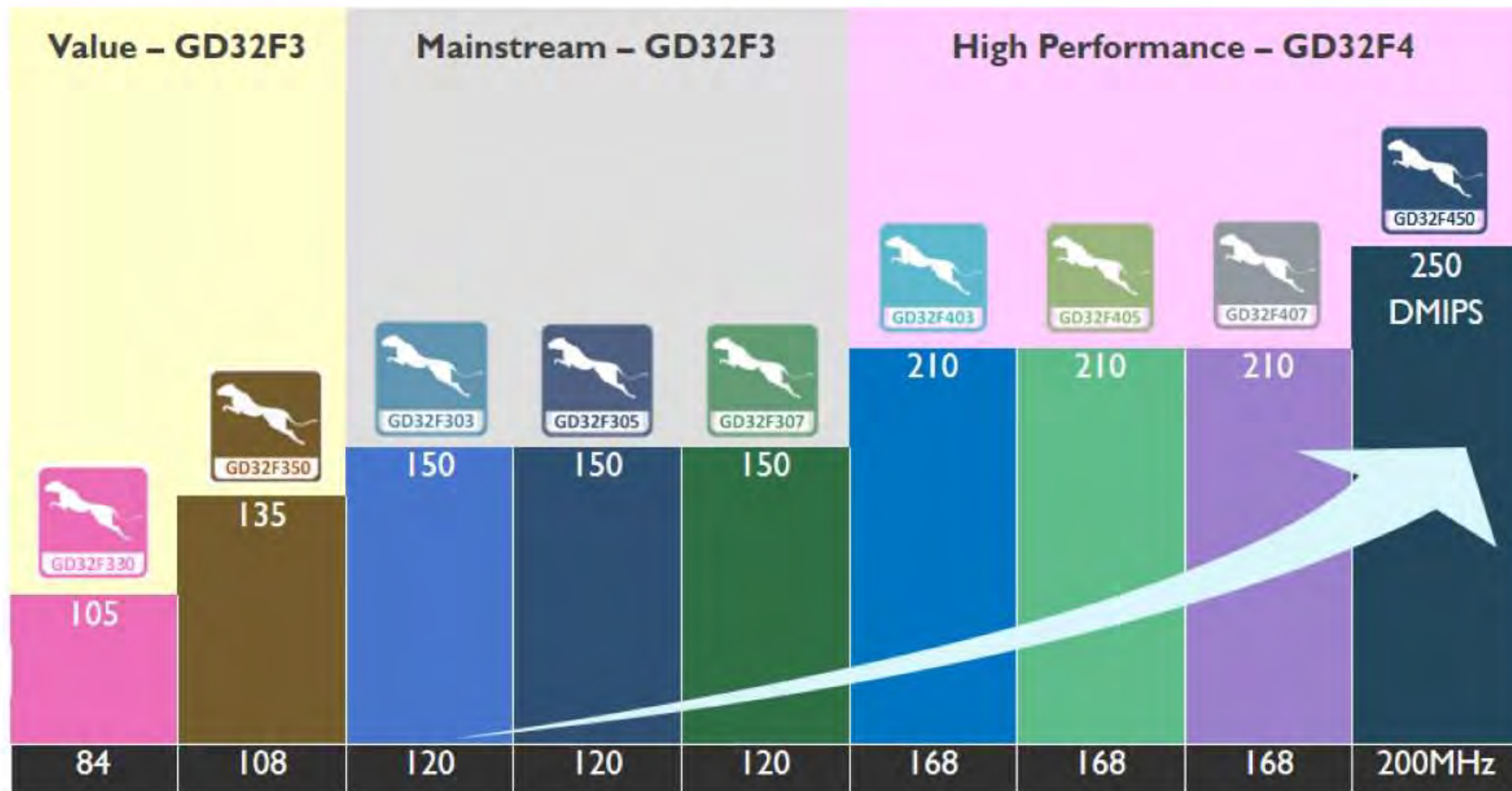
# GD32 MCU Family

| Type            | Arm® Cortex®-M 32-bit MCUs <small>(Flash KB/RAM KB)</small> |  |  |  | RISC-V MCUs  |  |
|-----------------|---|--|--|--|--|--|
| Core            | Cortex®-M23   | Cortex®-M3   | Cortex®-M4   | Cortex®-M33  | RISC-V   |  |
| GD32 MCU Family | High-Performance  | <b>GD32F205</b><br>120MHz, 3M/256K<br><b>GD32F207</b><br>120MHz, 3M/256K                                 | <b>GD32F450</b><br>200MHz, 3M/512K<br><b>GD32F407</b><br>168MHz, 3M/192K<br><b>GD32F405</b><br>168MHz, 3M/192K<br><b>GD32F403</b><br>168MHz, 3M/128K | <b>GD32E505</b><br>180MHz, 512K/128K<br><b>GD32E507</b><br>180MHz, 512K/128K<br><b>GD32E503</b><br>180MHz, 512K/128K                               |  |  |
|                 | Main-stream   | <b>GD32F105</b><br>108MHz, 1M/96K<br><b>GD32F103</b><br>108MHz, 3M/96K                                   | <b>GD32F107</b><br>108MHz, 1M/96K<br><b>GD32F101</b><br>56MHz, 3M/80K  | <b>GD32F305</b><br>120MHz, 1M/96K<br><b>GD32F303</b><br>120MHz, 3M/96K<br><b>GD32F307</b><br>120MHz, 1M/96K<br><b>GD32E103</b><br>120MHz, 128K/32K | <b>GD32VF103</b><br>120MHz, 128K/32K   |  |
|                 | Entry-Level   | <b>GD32E232</b><br>72MHz, 64K/8K<br><b>GD32E231</b><br>72MHz, 64K/8K<br><b>GD32E230</b><br>72MHz, 64K/8K | <b>GD32F170</b><br>48MHz, 64K/8K<br><b>GD32F190</b><br>72MHz, 64K/8K<br><b>GD32F130</b><br>48MHz, 64K/8K<br><b>GD32F150</b><br>72MHz, 64K/8K         | <b>GD32F330</b><br>84MHz, 128K/16K<br><b>GD32F350</b><br>108MHz, 128K/16K  |  <b>27 series</b><br><b>&gt;360 P/Ns</b> |  |
|                 | Specific  |  |  | <b>GD32FFPR</b><br>168MHz, 1M/128K   | <b>GD32EPRT</b><br>168MHz, 384K/96K+4M   |  |

# GD32 Cortex<sup>®</sup>-M3 Portfolios ~200P/N



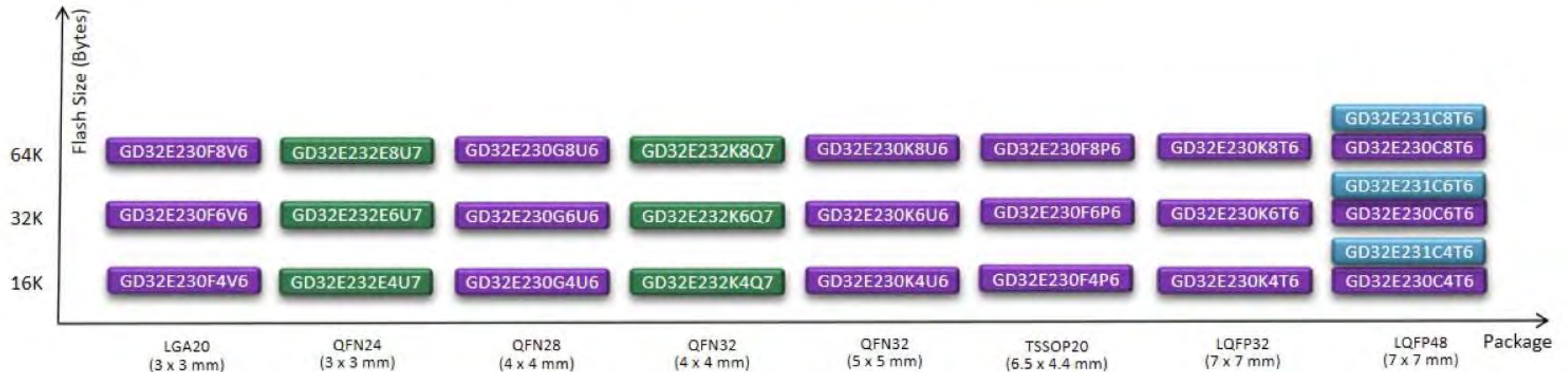
# GD32 Cortex<sup>®</sup>-M4 Portfolios ~100P/N



# GD32E23x Cortex<sup>®</sup>-M23 Value Portfolios



- ☑ GD32E230 & GD32E231 & GD32E232 Arm<sup>®</sup>Cortex<sup>®</sup>-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<sup>®</sup>-M33 Portfolios



- ☑ GD32E503/505/507/PRT high-performance line
- ☑ Cortex<sup>®</sup>-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)

## 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



## New peripherals enhance connectivity

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



## 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



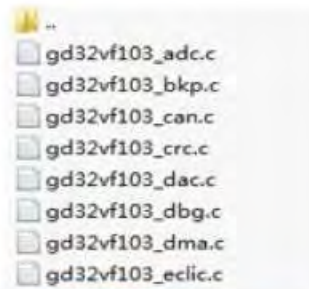
# GD32VF103 RISC-V Mainstream Portfolios



- ☑ 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



# 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

$\mu$ C/OS II  
FreeRTOS  
RT-Thread  
TencentOS Tiny  
OneOS



## Cloud Link

AWS  
Alibaba Cloud

# RISC-V Development Platform - SEGGER

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 Ver1.30 Support GD32V MCU

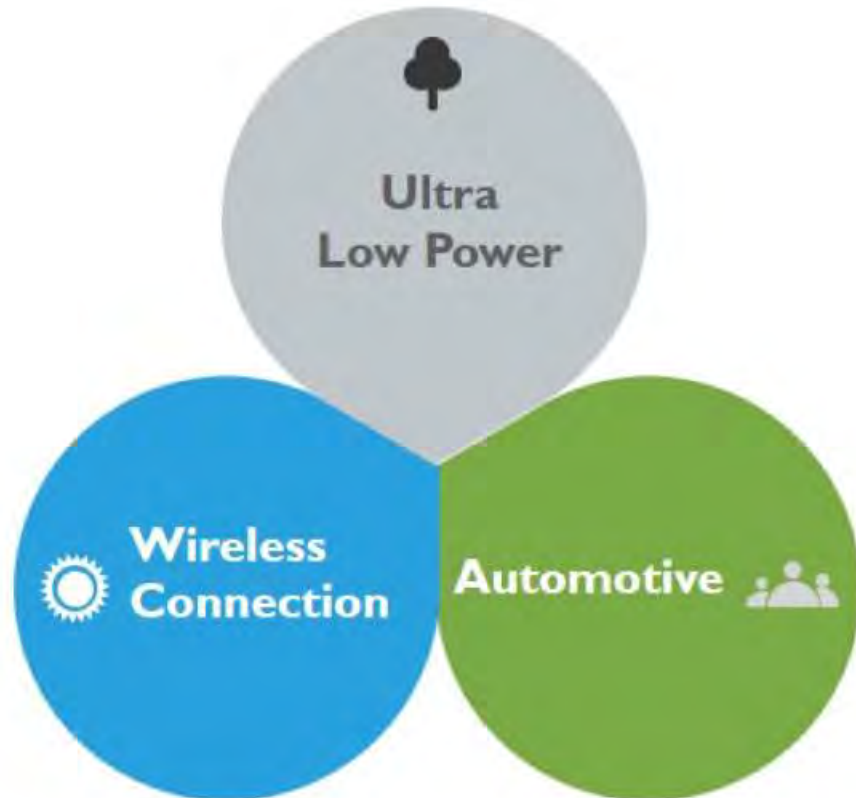
Free online video for the IDE and Evaluation Kit are available on YouTube, WeChat and other online platforms.





# Future Products

# MCU Focus Application



## Ultra Low Power

- Battery supply
- Portable application
- Wearable device

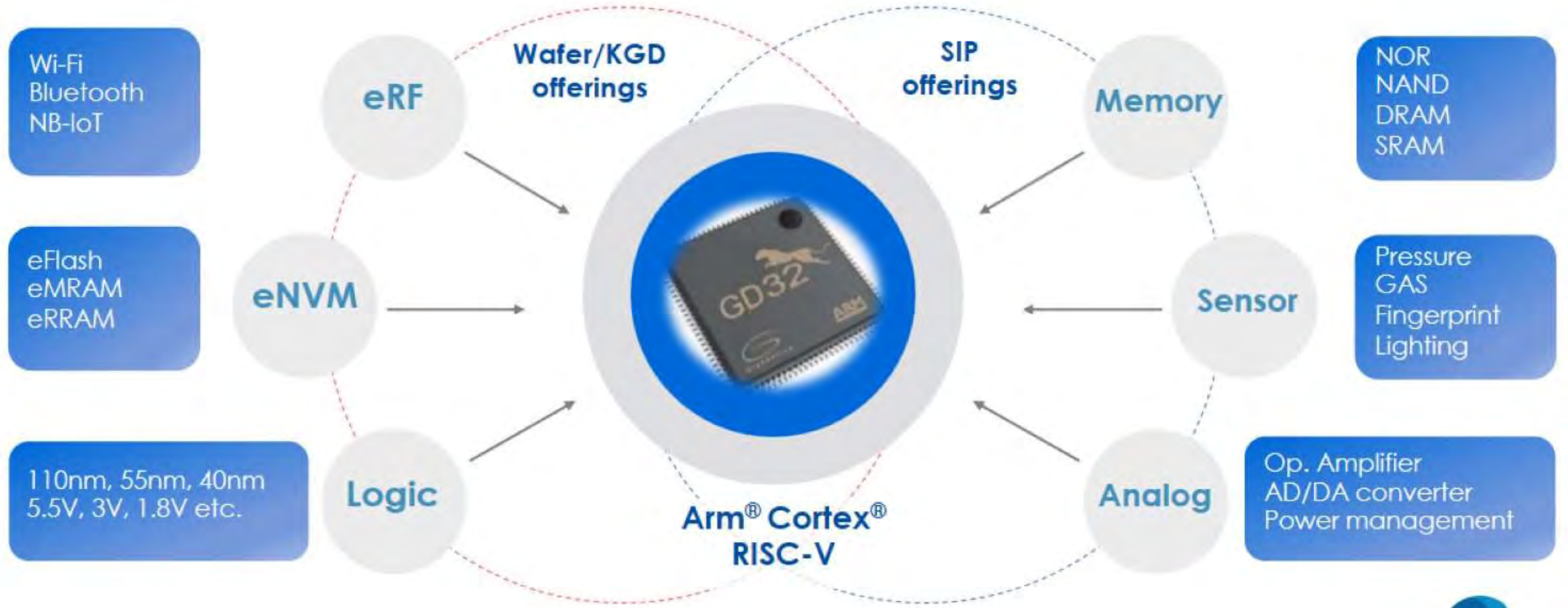
## Wireless Connection

- WiFi
- BT5.x / BLE Audio
- Sub 1GHz
- LPWAN/NB-IoT

## Automotive

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

# GD32 MCU Department Store







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**Thank You!**