GD32 series of ARM® Cortex®-M MCU Introduction

Eric Jin

Jul/2017

About GigaDevice

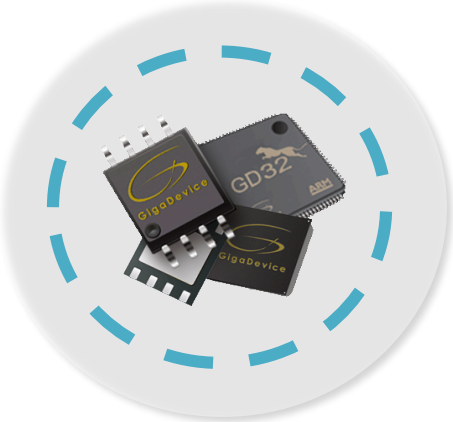
Founded in 2005

The Largest Volume Fabless SPI NOR Flash Supplier, World Wide

The 1st GD32 ARM® Cortex® -M MCU in China

Gigadevice Innovation: The 1st 8-pin SPI NAND Flash in the World

Sales Office Worldwide



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**

All the No.1 Product in mainland China

GD32 Family of 32-bit ARM® MCUs

- ✓ Latest 32-bit ARM® Cortex® -M core
- ✓ 19 complete product lines
- ✓ >300 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
- Multiple integrated peripherals
- Complete product lines for selection
- IDE & software compatible

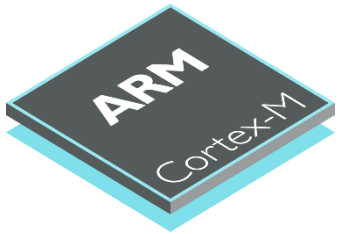
GD32

ARM CORTEX
Processor Technology
ARM University
Worldwide Education Program
ARM Connected Community

All Series Compatible

Cortex®-M3 | Cortex®-M4 | Cortex®-M23

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



Special landmark for GD32

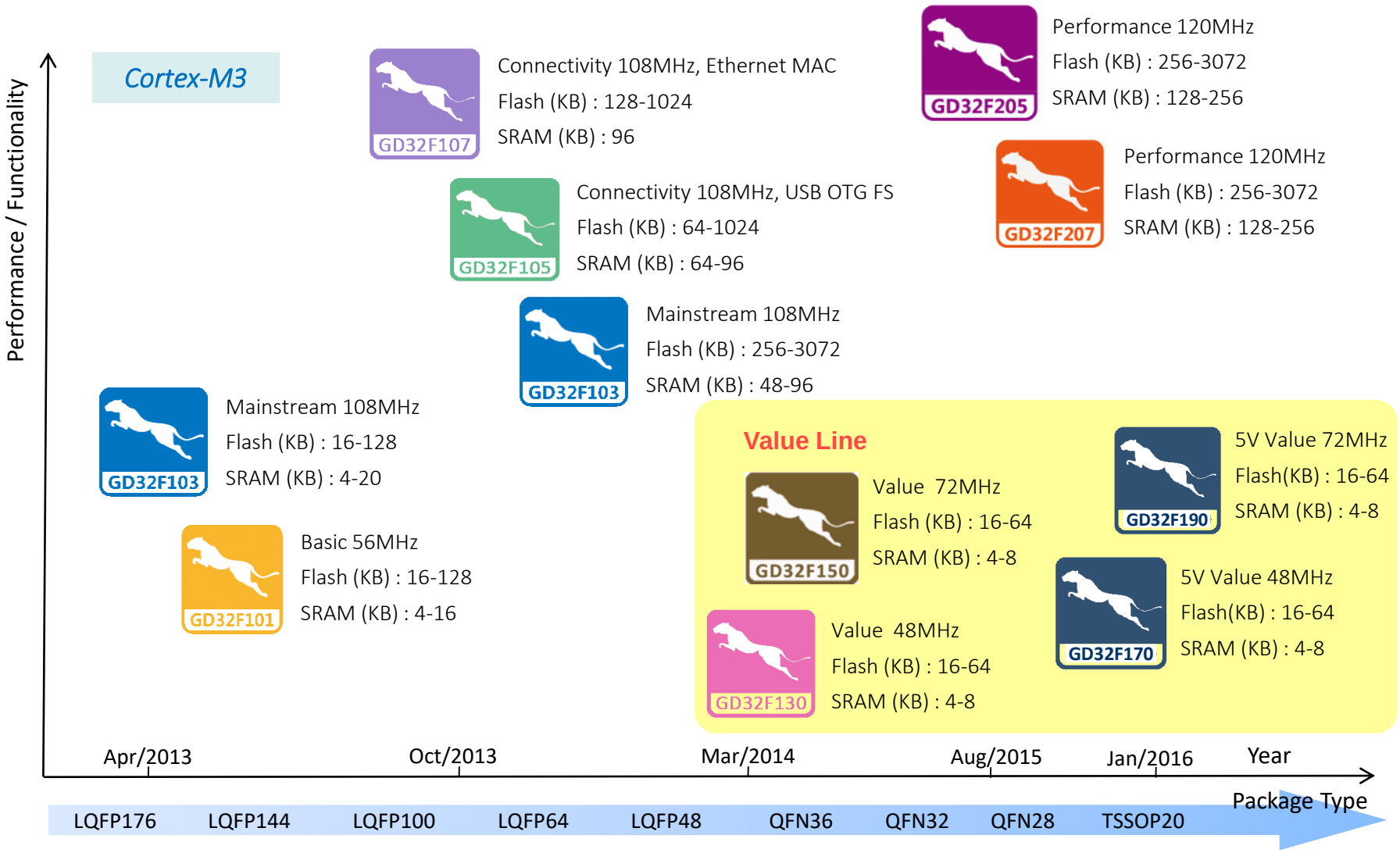
4 Years

100,000,000pcs total shipment

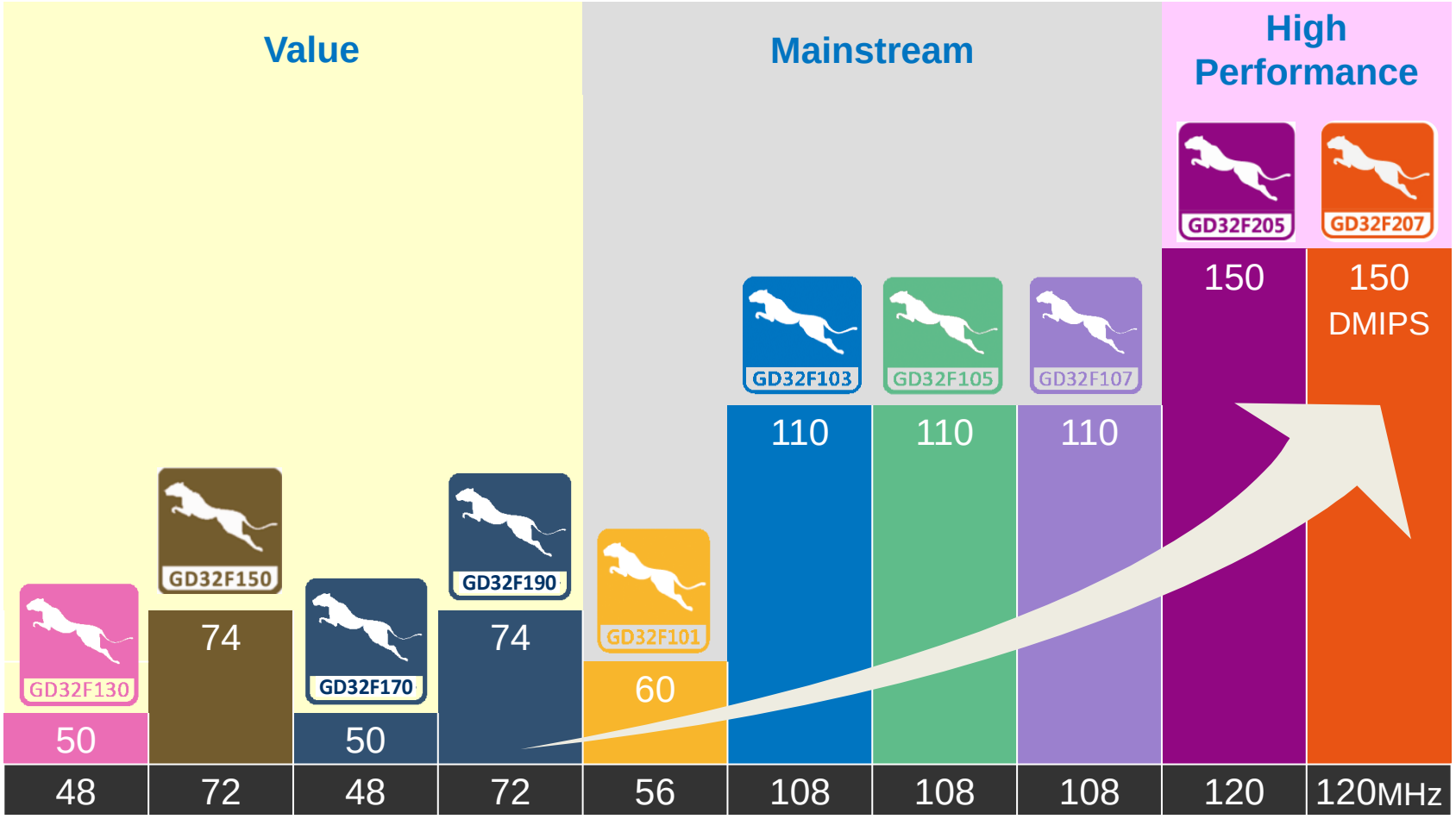
2013/4/16
Born in Beijing

2017/5
New Beginning

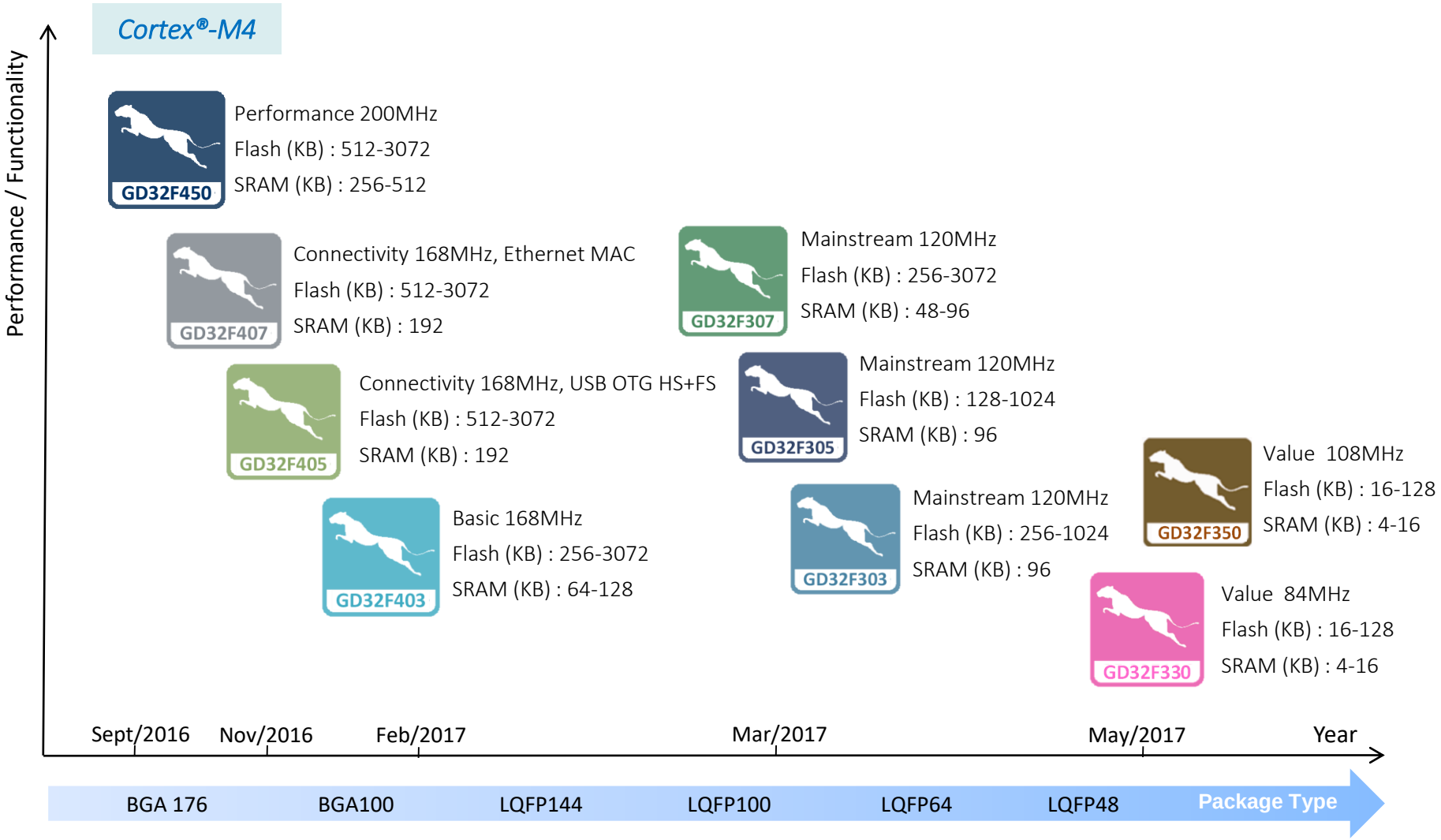
GD32 Cortex®-M3 MCU Roadmap



GD32 M3 Portfolio ~200P/N



GD32 Cortex®-M4 MCU Roadmap



GD32F4 series of Cortex®-M4 MCU

GigaDevice

GD32F4

4 families to expand F4 series and re-enforce leading position on high performance 32-bit MCUs.

GD32F450 Stretch Performance – 200MHz CPU+FPU

- Cortex®-M4 with Graphic TFT display engine
- Support image accelerator with external SDRAM

GD32F407 Innovative Connectivity – 168MHz CPU+FPU

- Support Ethernet and two USB OTG: FS+HS
- BGA176 10x10mm for more IO extension

GD32F405 Balance Connectivity – 168MHz CPU+FPU

- Balance between performance, connectivity and cost
- Smaller CM4, BGA100 7x7mm for a 3072KB

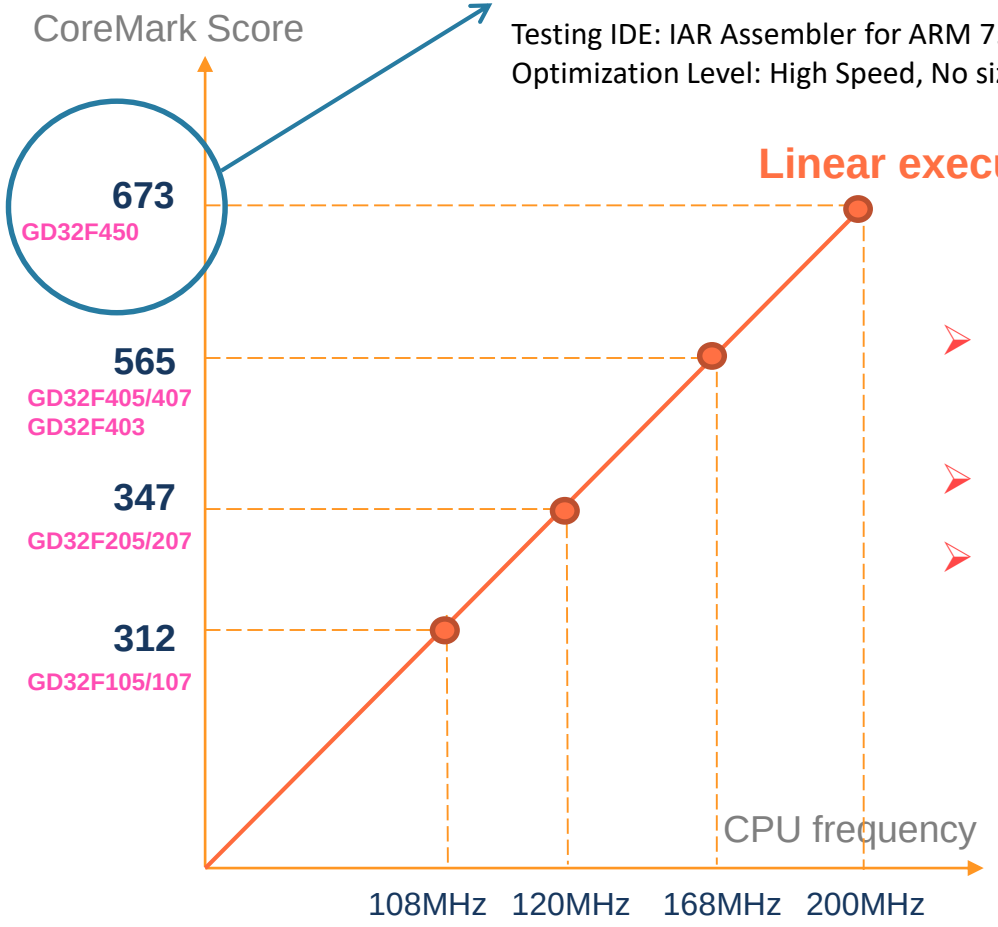
GD32F403 Performance Entry – 168MHz CPU+FPU

- Basic level with balance of performance and cost
- Smaller CM4, BGA100 7x7mm for a 3072KB

New GD32F4, Leading Performance

#1 Cortex®-M4 rank on CoreMark®

Testing IDE: IAR Assembler for ARM 7.40.2.8542
Optimization Level: High Speed, No size constraint



- **Up to 200** MHz / **250** DMIPS with **Flash access Zero wait-state**
- **Up to 673** CoreMark Result
- ARM Cortex-M4 DSP + floating-point unit (FPU)

New GD32F450, High Integration


BGA176 (10 x 10 mm)
LQFP144 (20 x 20 mm)
LQFP100 (14 x 14 mm)

Stretch Performance of GD32F4

- Cortex®-M4 Core @ 200 MHz
- Support H/W DSP instructions + FPU
- Zero-wait state execution from Flash memory

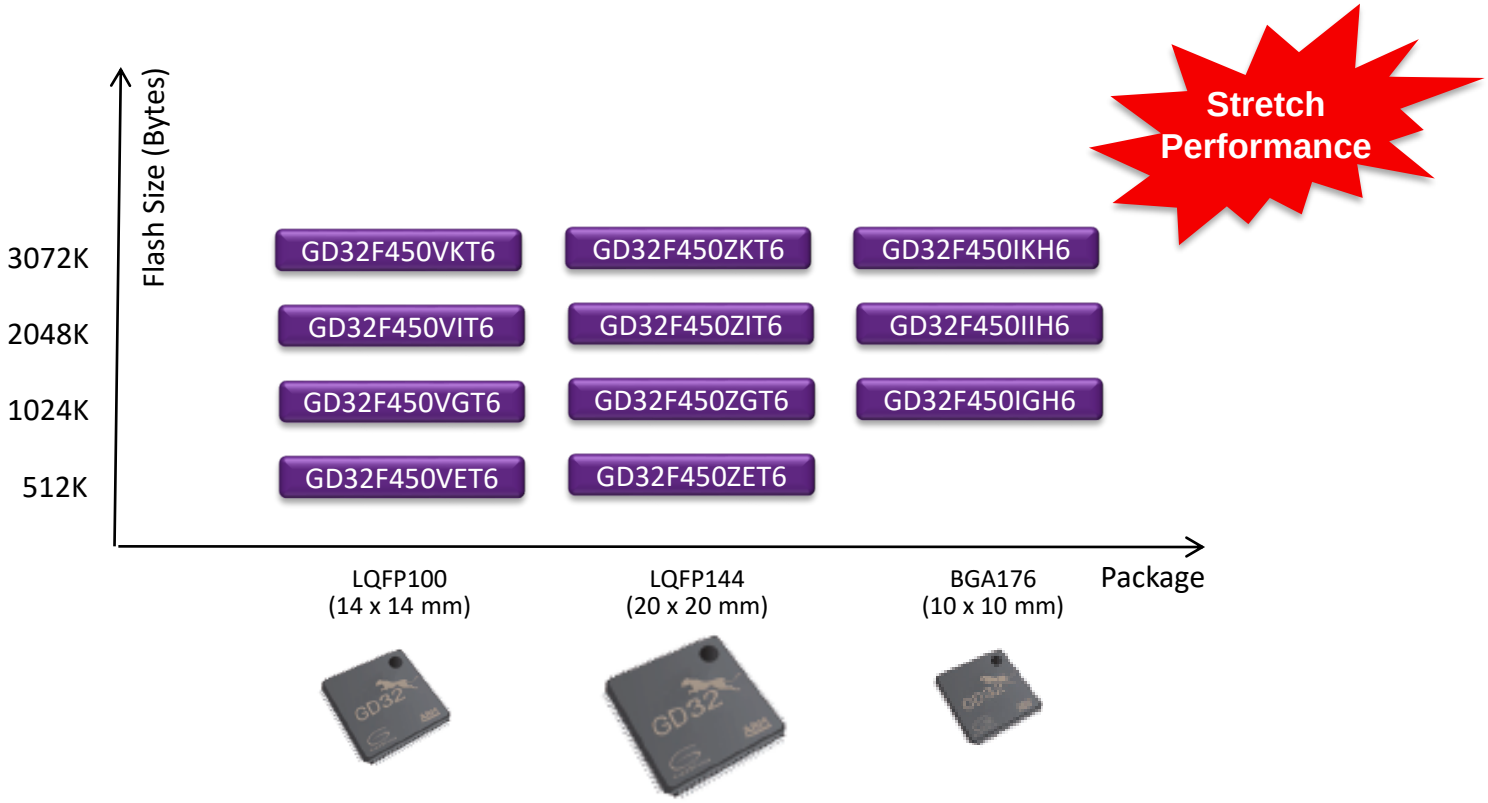
- Flash from 512 KB to 3072 KB
- SRAM from 256KB to 512KB
- EXMC interface support external SDRAM & SRAM

- Up to 8 x UART (9Mbit/s)
- Up to 6 x SPI (30Mbit/s)
- Up to 3 x I2C (400Kbit/s)
- Up to 2 x CAN2.0B
- Up to 2 x I2S
- Support SDIO, Ethernet MAC
- Support USB OTG FS + HS
- 8-14bit Camera Interface + IPA
- LCD-TFT controller up to XGA resolution
- Up to 3 x 12bit, 2.6M SPS ADCs (up to 24 chs)
- Up to 2 DACs

- Standby Current @ 2uA

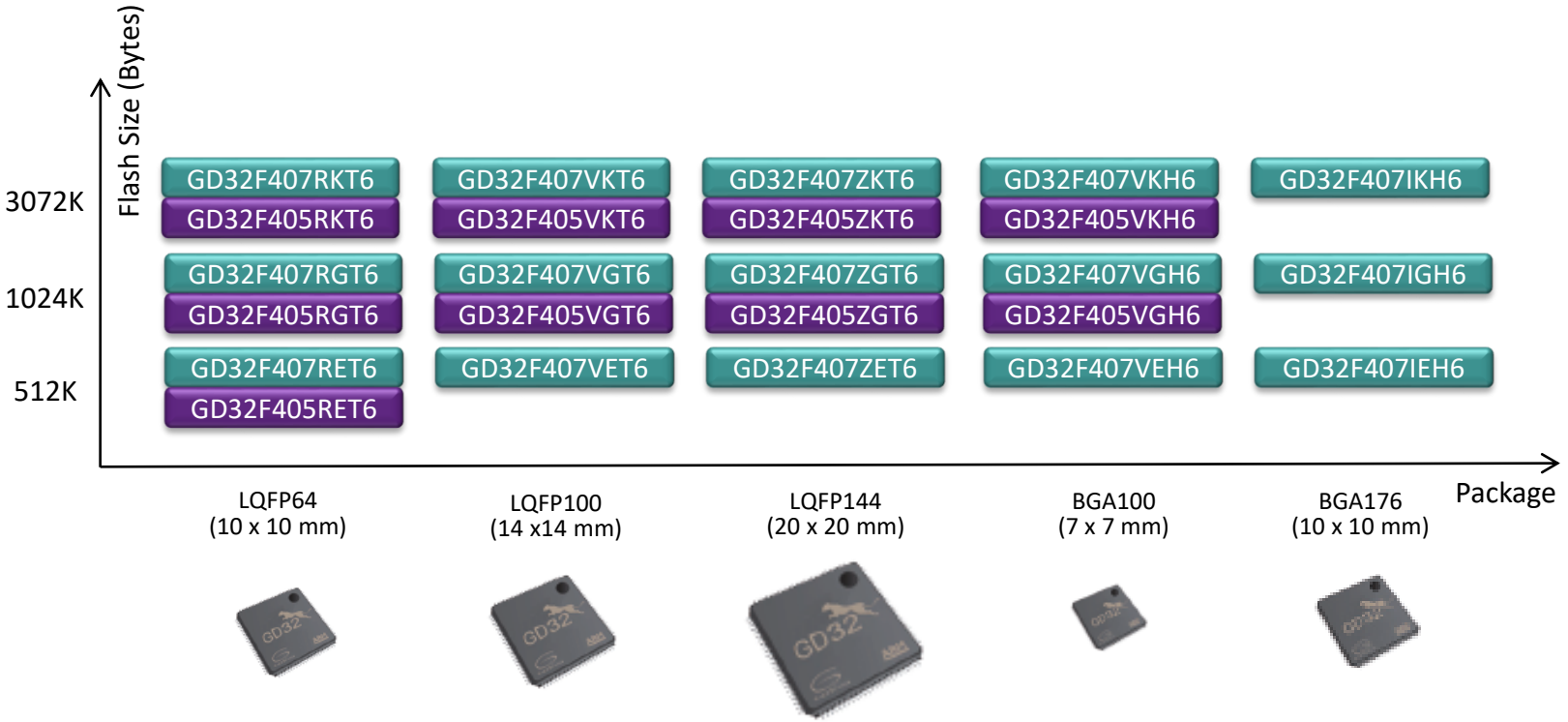
GD32F450 Portfolios

- ☑ GD32F450 Cortex®-M4 stretch performance line
- ☑ 256K-3072K Flash, 256K-512K SRAM
- ☑ 2.6-3.6V supply; 5V tolerance I/Os
- ☑ -40℃ to +85℃ industrial level operating temperature
- ☑ Series pin to pin compatible and flexible S/W compatible



GD32F405/407 Portfolios

- ☑ GD32F405 and GD32F407 Cortex®-M4 connectivity line
- ☑ 512K-3072K Flash, 192K SRAM
- ☑ 2.6-3.6V supply; 5V tolerance I/Os
- ☑ -40℃ to +85℃ industrial level operating temperature
- ☑ Series pin to pin compatible and flexible S/W compatible



GD32F403 Portfolios

GigaDevice

Performance Entry

- ☑ GD32F403 Cortex®-M4 performance entry line
- ☑ 256-3072KB Flash, 64-128KB SRAM
- ☑ 2.6-3.6V supply; 5V tolerance I/Os
- ☑ -40℃ to +85℃ industrial level operating temperature
- ☑ Series pin to pin compatible and flexible S/W compatible

Flash Size (Bytes)	LQFP64 (10 x 10 mm)	LQFP100 (14 x 14 mm)	LQFP144 (20 x 20 mm)	BGA100 (7 x 7 mm)
3072K	GD32F403RKT6	GD32F403VKT6	GD32F403ZKT6	GD32F403VKH6
2048K	GD32F403RIT6	GD32F403VIT6	GD32F403ZIT6	GD32F403VIH6
1024K	GD32F403RGT6	GD32F403VGT6	GD32F403ZGT6	GD32F403VGH6
512K	GD32F403RET6	GD32F403VET6	GD32F403ZET6	GD32F403VEH6
256K	GD32F403RCT6	GD32F403VCT6	GD32F403ZCT6	GD32F403VCH6

Package

GD32F3 series of Cortex®-M4 MCU

GigaDevice

GD32F3

5 families from mainstream to value
for mid-end and low-end using of 32-bit MCUs.

GD32F307 Mainsteam Connectivity – 120MHz Fcpu

- Cortex®-M4 Support Ethernet and USB OTG FS

GD32F305 Mainsteam Connectivity – 120MHz Fcpu

- Support USB OTG FS with higher performance

GD32F303 Mainsteam Balance – 120MHz Fcpu

- Best balance between performance, connectivity and cost

GD32F350 Value Connectivity – 108MHz Fcpu

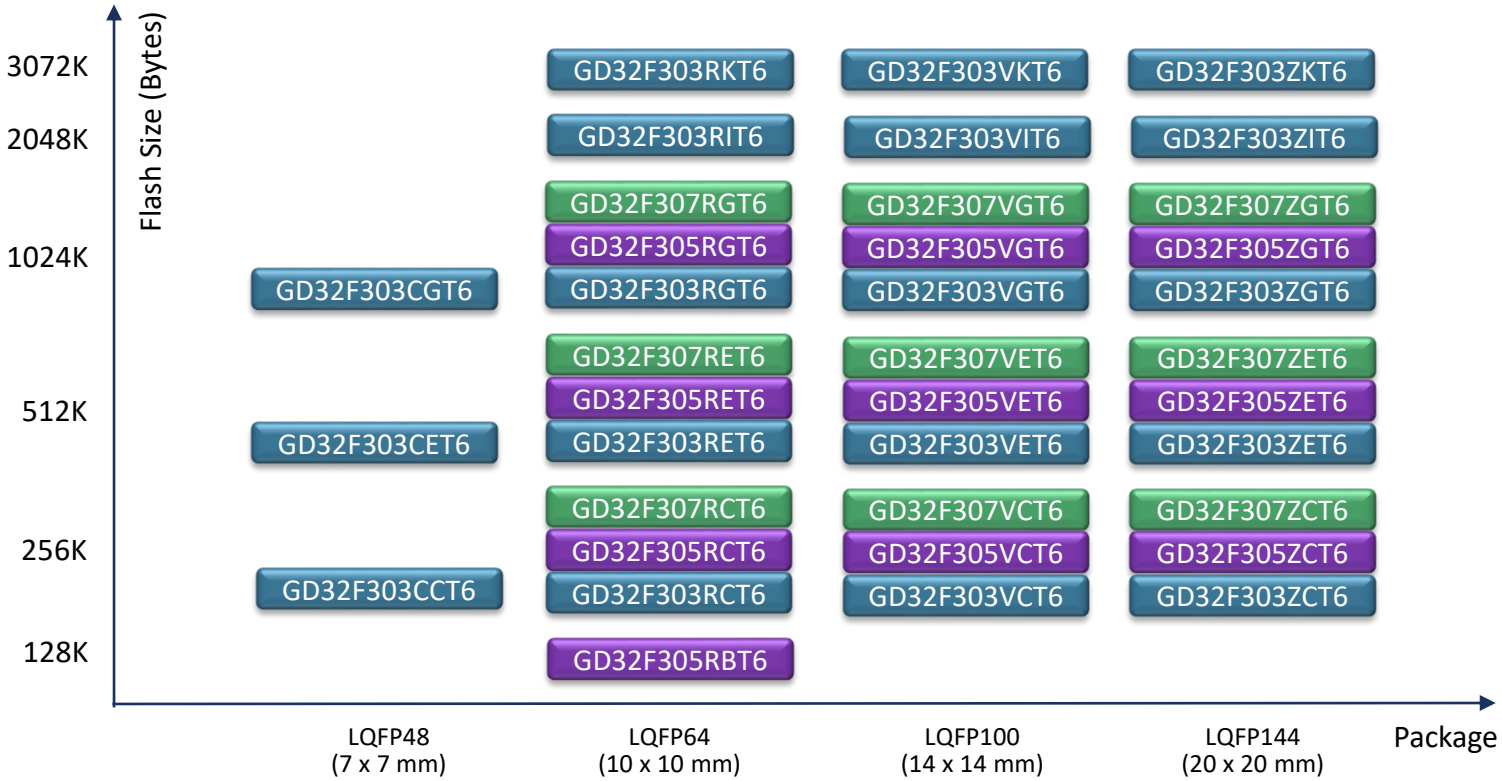
- Value level with balance of CM4 performance and connectivity

GD32F330 Value Entry – 84MHz Fcpu

- Value level for 32-bit entry and cost saver

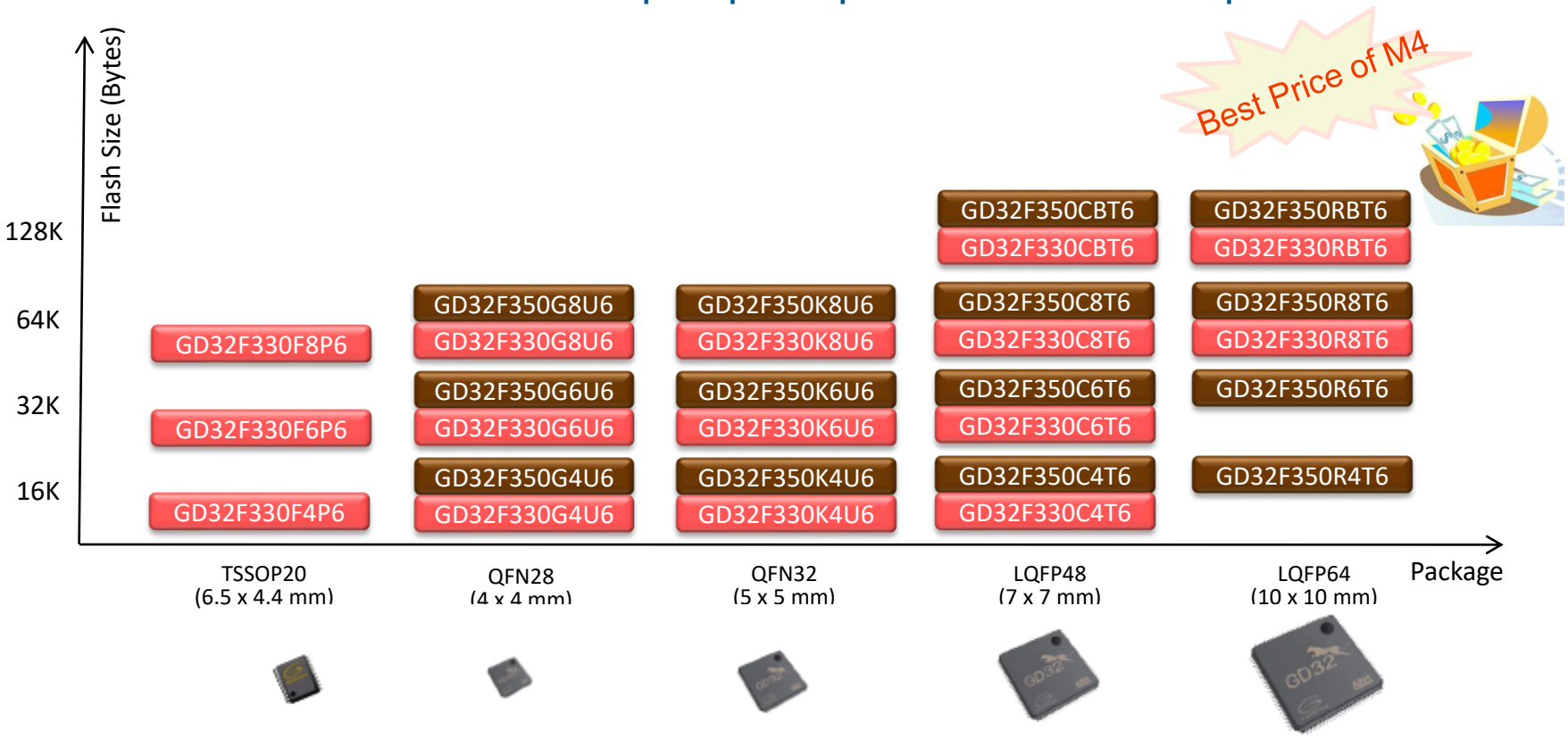
GD32F30x Mainstream Portfolios

- ☑ GD32F303/305/307 Cortex®-M4 mainstream line
- ☑ 128-3072KB Flash, 48-96KB SRAM
- ☑ 2.6-3.6V supply; 5V tolerance I/Os
- ☑ -40℃ to +85℃ industrial level operating temperature
- ☑ Series pin to pin compatible and flexible S/W compatible



GD32F330/350 Value Portfolios

- ☑ GD32F330 and GD32F350 value line
- ☑ 16K-128K Flash, 4K-16K SRAM
- ☑ 2.6-3.6V supply; 5V tolerance I/Os
- ☑ -40℃ to +85℃ industrial level operating temperature
- ☑ Series pin to pin compatible and flexible S/W compatible



GD32F3x0 Advantage

GD32F3x0 series of value line Feature	Advantage
◆ ARM® Cortex-M4® 32-bit Core ◆ Flash access Zero wait-state ◆ 7 Channel DMA	Brings valued high-performance with higher real-time response speed
◆ 5 x 16-bit GP. Timer with PWM output ◆ 1 x 32-bit GP. Timer with PWM output ◆ 1 x Adv. Timer for 3-phase complementary output ◆ 1 x Basic counting Timer	Best choice for industrial control
10.5Mbit/s USART, 30Mbit/s SPI, 1MHz I2C	Basic communication interface integrated
◆ 12-bit 2.6M SPS ADC ◆ 12-bit DAC ◆ OP-AMP, Comparator, I_{REF}/$V_{REF,}$ etc.	Advanced analog peripherals integrated
2 * Watchdog, Calendar RTC POR/PDR/LVD, PLL, HSI/LSI	System cost down
Lowest Price down to U$0.30/ea	BOM cost down for 8-bit & 16-bit upgrade

GD32F330FxP6 Introduction

GD32F330F8P6
GD32F330F6P6
GD32F330F4P6

TSSOP-20

Simply entry M4 with the best price!

- Cortex®-M4 Core @ 84 MHz

- Flash from 16 KB to 64 KB
- SRAM from 4 KB to 8 KB
- Up to 18KB ISP loader ROM

- Up to 2 x USART (10.5Mbit/s)
- Up to 2 x SPI (30Mbit/s)
- Up to 2 x I2C (1Mbit/s)
- 1 x 12bit, 2.6M SPS ADC (up to 9 chs),

- Three Power saving mode
- Battery supply for RTC and backup register
- Standby Current < 1uA

GD32 Typical Application Market

Card Reader

- IC & RFID card reader
- Access Control
- ETC

New Energy Control

- Battery Charging & discharging
- LED road lamp, LED display Wall
- Solar power station & MPPT

Industrial Control

- Motor Control
- Inverter
- Industrial PLC

Security & Surveillance

- Alarm
- Video surveillance dome
- Fire and CO monitor

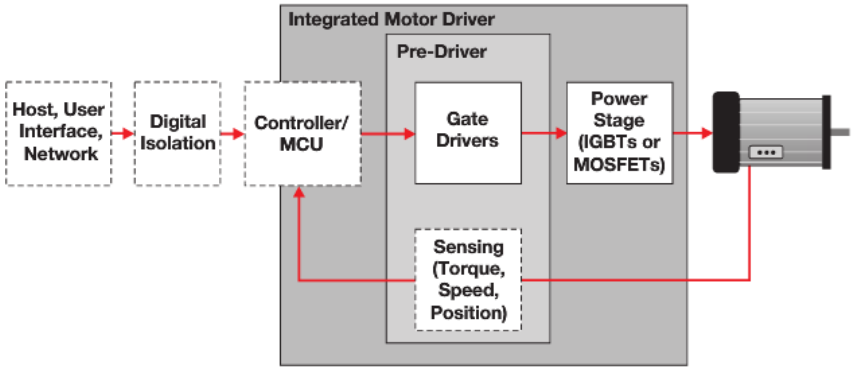
Micro Printer

- POS
- Embedded printer
- Electronic payment

Medical & Health

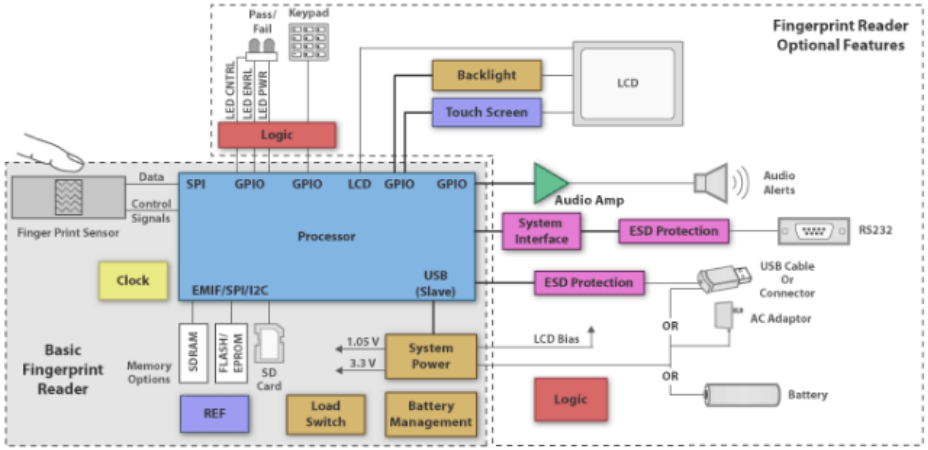
- Oximeter, ECG
- Blood pressure meter
- Portable personal monitor

Focus Segment – Motor Control



- High performance processing
- Advanced ADC
- More analog peripherals integrated
- PWM control & FOC algorithm
- Sine wave & frequency conversion trend

Focus Segment – FPR



Fingerprint Recognition widely used with rapid growth in the following market:

- Gate lock & safe case
- Identity card reader
- Tablet PC & Mobile
- Military application

MCU is IoT “Node”

- High performance
- Cost-effective
- Easy use

GD32 MCU IOT End-Product

Intelligent Life

Intelligent lighting

Intelligent socket

Health gateway

Drone

Scooters

Robert

VR

Industry Connectivity

Embedded WIFI module

Security

BLE Module

Gate Lock

RFID label

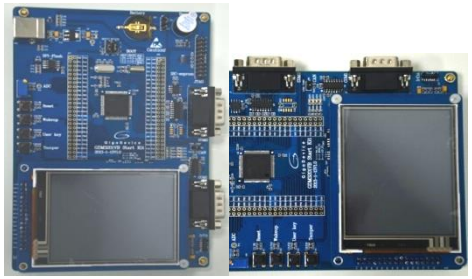
Barcode scanning

OBD

GD32 Development Eco-system

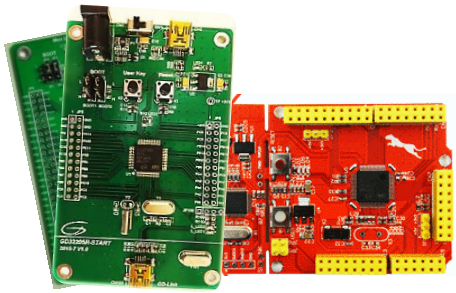
GD32 MCU full function Eval-board

- For on-chip function fully evaluation, including interfaces, external memory bus and LCD, etc.
- Extension header for available I/Os for quick connection to prototyping board and easy probing with onboard GD-link.



GD32 MCU learning starter kit

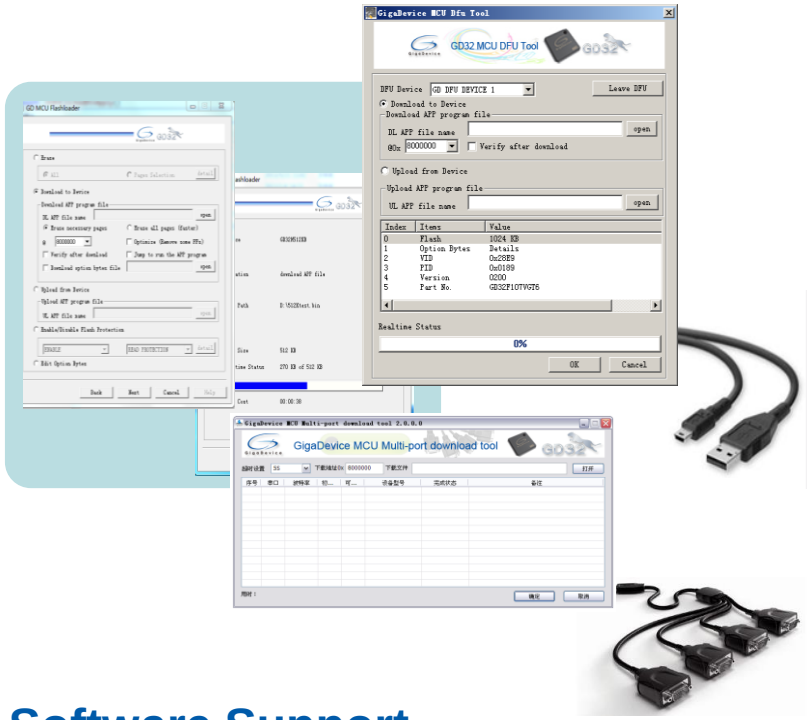
- Based on GD32 series MCU entry level starter kit, extension header for all package pins for quick connection to prototyping board and easy probing with onboard GD-link or other compatible simulators.
- Support Arduino compatible interface in selected model

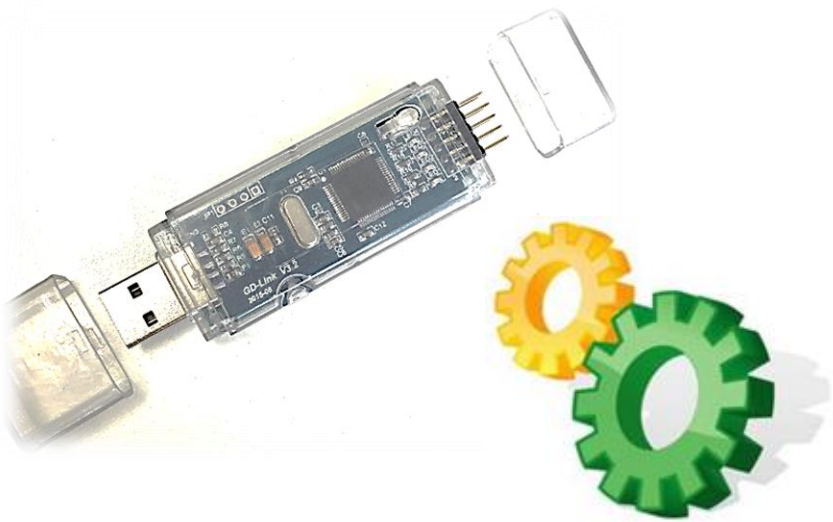


Build GD32 development environment with H/W and S/W compatible

KEIL Tools by ARM, IAR SYSTEMS, CrossWorks, CERTIFIED USB, J-link, SEGGER, Wellon, SUPERPRO, ZLG, ELNEC, PE micro

GD32 Development Tools





Software Support

- GD32 MCU ISP Programmer
- GD32 MCU DFU Tool
- GD32 MCU Multi-Port Download Tool

GD-Link 3-in-1 Tool

- GD-Link on-line Debugger
- GD-Link on-line Programmer
- GD-Link off-line Programmer

GD32 Development Tools

Products of Development Tools and Boards

Events & Activities

Programs for Teaching & Learning

- 01_GPIO_LED
- 02_GPIO_KeyBoard_Polling_mode
- 03_GPIO_KeyBoard_Interrupt_mode
- 04_USART1_Printf
- 05_USART1_Echo_Interrupt_mode
- 06_USART1_DMA
- 07_I2C_EEPROM
- 08_SPI_QSPI_Flash
- 09_EXMC_NandFlash
- 10_SDIO_SDCardTest
- 11_RTC_Calendar
- 12_ADC_Temperature_Sensor_REFINT_Channel
- 13_DAC_Output_Voltage_Value
- 14_CAN_Dual_CAN
- 15_CRYP
- 16_HASH
- 17_RNG
- 18_TLDI_without_GUI
- 19_Tamper_Waveform_Detection
- 20_USB_OTG_Device_Mouse
- 21_USB_OTG_Device_Usb_disk
- 22_USB_OTG_Device_VirtualCOMPort
- 23_USB_OTG_Host_Accesses_Usb_disk
- 24_ETH

GD32 Handle Industry Challenges Easily

Product Line

Multiplex products

Best peripherals

Service

Sufficient Capacity

Fast lead time

Series compatible

Easy to use

Eco-system

High Performance

Cost-effective

Quality

Thanks !

GD32

Outstanding Value
Innovation Choice

www.GD32MCU.com