GD32 series of ARM® Cortex®-M MCU
Introduction

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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

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

All Series Compatible

- Scalable architecture
- Fit for simple to complex application
- Same development experiences
- Consolidated development costs
Special landmark for GD32

2013/4/16
Born in Beijing

100,000,000 pcs total shipment

2017/5
New Beginning
GD32 M3 Portfolio ~200P/N

- **Value**
  - GD32F130: 50
  - GD32F150: 74
  - GD32F170: 74

- **Mainstream**
  - GD32F103: 60
  - GD32F105: 110
  - GD32F107: 110

- **High Performance**
  - GD32F205: 150 DMIPS
  - GD32F207: 150 DMIPS

Performance Highlights:

- **DMIPS**: 74, 110, 110, 110, 150
- **MHz**: 48, 50, 72, 72, 120
GD32 Cortex®-M4 MCU Roadmap

**Cortex®-M4**

- **Performance 200MHz**
  - Flash (KB): 512-3072
  - SRAM (KB): 256-512

- **Connectivity 168MHz, Ethernet MAC**
  - Flash (KB): 512-3072
  - SRAM (KB): 192

- **Connectivity 168MHz, USB OTG HS+FS**
  - Flash (KB): 512-3072
  - SRAM (KB): 192

- **Basic 168MHz**
  - Flash (KB): 256-3072
  - SRAM (KB): 64-128

- **Mainstream 120MHz**
  - Flash (KB): 256-3072
  - SRAM (KB): 48-96

- **Value 108MHz**
  - Flash (KB): 16-128
  - SRAM (KB): 4-16

- **Value 84MHz**
  - Flash (KB): 16-128
  - SRAM (KB): 4-16

- **Value 108MHz**
  - Flash (KB): 16-128
  - SRAM (KB): 4-16

**Package Type**

- BGA 176
- BGA100
- LQFP144
- LQFP100
- LQFP64
- LQFP48

*Year*}

Sept/2016  Nov/2016  Feb/2017  Mar/2017  May/2017
GD32F4 series of Cortex®-M4 MCU

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

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

BGA176 (10 x 10 mm)
LQFP144 (20 x 20 mm)
LQFP100 (14 x 14 mm)
GD32F450 Portfolios

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

Flash Size (Bytes)

- 3072K
  - GD32F450VKT6
  - GD32F450ZKT6
  - GD32F450IKH6

- 2048K
  - GD32F450VIT6
  - GD32F450ZIT6
  - GD32F450IIH6

- 1024K
  - GD32F450VGT6
  - GD32F450ZGT6
  - GD32F450IGH6

- 512K
  - GD32F450VET6
  - GD32F450ZET6

Package

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

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

Flash Size (Bytes)
- 3072K
  - GD32F407RKT6
  - GD32F405RKT6
- 1024K
  - GD32F407RT6
  - GD32F405RT6
- 512K
  - GD32F407RET6
  - GD32F405RET6

Package
- LQFP64 (10 x 10 mm)
- LQFP100 (14 x 14 mm)
- LQFP144 (20 x 20 mm)
- BGA100 (7 x 7 mm)
- BGA176 (10 x 10 mm)
GD32F403 Portfolios

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

<table>
<thead>
<tr>
<th>Flash Size (Bytes)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>3072K</td>
<td>LQFP100 (14 x 14 mm)</td>
</tr>
<tr>
<td>2048K</td>
<td>LQFP144 (20 x 20 mm)</td>
</tr>
<tr>
<td>1024K</td>
<td>BGA100 (7 x 7 mm)</td>
</tr>
<tr>
<td>512K</td>
<td>LQFP64 (10 x 10 mm)</td>
</tr>
<tr>
<td>256K</td>
<td></td>
</tr>
</tbody>
</table>

Series pin to pin compatible and flexible S/W compatible
## GD32F3 series of Cortex®-M4 MCU

**GD32F3**

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Mainstream Connectivity – 120MHz Fcpu</th>
<th>Value Connectivity – 108MHz Fcpu</th>
<th>Value Entry – 84MHz Fcpu</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD32F307</td>
<td>• Cortex®-M4 Support Ethernet and USB OTG FS</td>
<td>• Value level with balance of CM4 performance and connectivity</td>
<td>• Value level for 32-bit entry and cost saver</td>
</tr>
<tr>
<td>GD32F305</td>
<td>• Support USB OTG FS with higher performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GD32F303</td>
<td>• Best balance between performance, connectivity and cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GD32F3 families from mainstream to value for mid-end and low-end using of 32-bit MCUs.
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°C to +85°C industrial level operating temperature**
- **Series pin to pin compatible and flexible S/W compatible**

<table>
<thead>
<tr>
<th>Flash Size (Bytes)</th>
<th>GD32F303CGT6</th>
<th>GD32F303CET6</th>
<th>GD32F303CCT6</th>
<th>GD32F303CGT6</th>
<th>GD32F303CET6</th>
<th>GD32F303CCT6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3072K</td>
<td>GD32F303RKT6</td>
<td>GD32F303VKT6</td>
<td>GD32F303ZKT6</td>
<td>GD32F303RKT6</td>
<td>GD32F303VKT6</td>
<td>GD32F303ZKT6</td>
</tr>
<tr>
<td>2048K</td>
<td>GD32F303RIT6</td>
<td>GD32F303VIT6</td>
<td>GD32F303ZIT6</td>
<td>GD32F303RIT6</td>
<td>GD32F303VIT6</td>
<td>GD32F303ZIT6</td>
</tr>
<tr>
<td>1024K</td>
<td>GD32F305RGT6</td>
<td>GD32F305VGT6</td>
<td>GD32F305ZGT6</td>
<td>GD32F305RGT6</td>
<td>GD32F305VGT6</td>
<td>GD32F305ZGT6</td>
</tr>
<tr>
<td>512K</td>
<td>GD32F303RET6</td>
<td>GD32F303VET6</td>
<td>GD32F303ZET6</td>
<td>GD32F303RET6</td>
<td>GD32F303VET6</td>
<td>GD32F303ZET6</td>
</tr>
<tr>
<td>256K</td>
<td>GD32F303RBT6</td>
<td>GD32F303VBT6</td>
<td>GD32F303ZBT6</td>
<td>GD32F303RBT6</td>
<td>GD32F303VBT6</td>
<td>GD32F303ZBT6</td>
</tr>
<tr>
<td>128K</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Packages**
- LQFP48 (7 x 7 mm)
- LQFP64 (10 x 10 mm)
- LQFP100 (14 x 14 mm)
- LQFP144 (20 x 20 mm)
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°C to +85°C industrial level operating temperature
- Series pin to pin compatible and flexible S/W compatible
# GD32F3x0 Advantage

<table>
<thead>
<tr>
<th>GD32F3x0 series of value line Feature</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>✈ ARM® Cortex-M4® 32-bit Core ✈ Flash access Zero wait-state ✈ 7 Channel DMA</td>
<td>Brings valued high-performance with higher real-time response speed</td>
</tr>
<tr>
<td>✈ 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</td>
<td>Best choice for industrial control</td>
</tr>
<tr>
<td>10.5Mbit/s USART, 30Mbit/s SPI, 1MHz I2C</td>
<td>Basic communication interface integrated</td>
</tr>
<tr>
<td>✈ 12-bit 2.6M SPS ADC ✈ 12-bit DAC ✈ OP-AMP, Comparator, I&lt;sub&gt;REF&lt;/sub&gt;/V&lt;sub&gt;REF&lt;/sub&gt;, etc.</td>
<td>Advanced analog peripherals integrated</td>
</tr>
<tr>
<td>2 * Watchdog, Calendar RTC&lt;br&gt; POR/PDR/LVD, PLL, HSI/LSI</td>
<td>System cost down</td>
</tr>
<tr>
<td>Lowest Price down to U$0.30/ea</td>
<td>BOM cost down for 8-bit &amp; 16-bit upgrade</td>
</tr>
</tbody>
</table>
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

Price US$0.30
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
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
- Health gateway
- Embedded WIFI module
- BLE Module
- Gate Lock
- RFID label

Intelligent lighting

Industry Connectivity
- Security
- Barcode scanning
- OBD

Intelligent socket

Scooters

Drone

VR

Robert
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
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
GD32 Handle Industry Challenges Easily

Product Line
- Multiplex products
- Best peripherals

Series compatible
- Easy to use

Eco-system

Service
- Sufficient Capacity
- Fast lead time

High Performance
- Cost-effective

Quality
Thanks!

Outstanding Value
Innovation Choice

www.GD32MCU.com