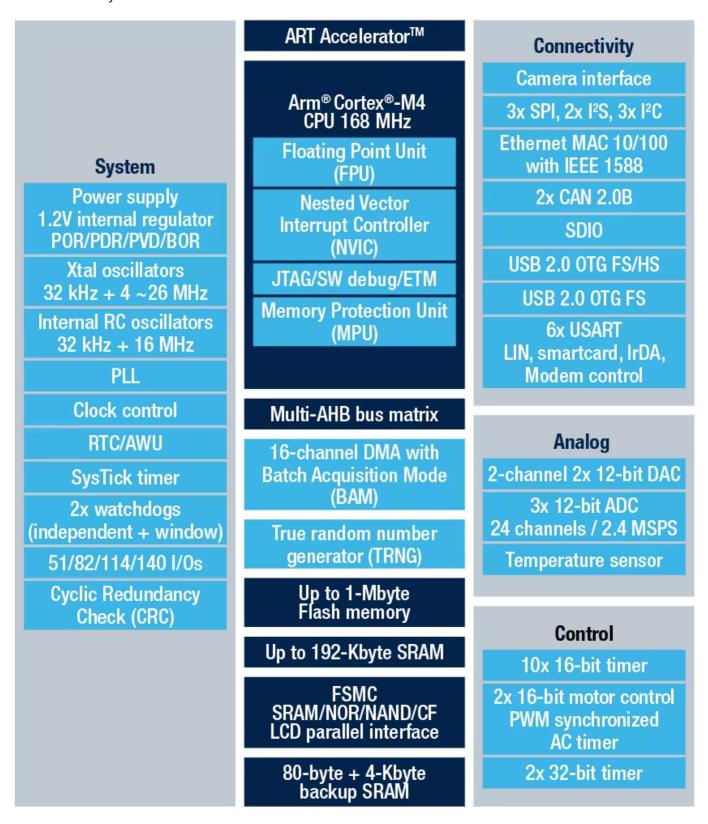# STM32F407VG microcontroller and its features

The STM32F4DISCOVERY board hosts STM32F407VG microcontroller.

Here are the key features of STM32F407VG microcontroller:

System

- Power supply 1.2V internal regulator POR/PDR/PVD/BOR
- Xtal oscillators 32 kHz + 4 ~26 MHz
- Internal RC oscillators 32 kHz + 16 MHz
- PLL
- Clock control
- RTC/AWU
- SysTick timer
- 2x watchdogs (independent + window)
- 51/82/114/140 I/Os
- Cyclic Redundancy Check (CRC)

ART Accelerator™

- Arm® Cortex®-M4 CPU 168 MHz
  - Floating Point Unit (FPU)
  - Nested Vector Interrupt Controller (NVIC)
  - JTAG/SW debug/ETM
  - Memory Protection Unit (MPU)

Multi-AHB bus matrix

- 16-channel DMA with Batch Acquisition Mode (BAM)
- True random number generator (TRNG)
- Up to 1-Mbyte Flash memory
- Up to 192-Kbyte SRAM
- FSMC SRAM/NOR/NAND/CF LCD parallel interface
- 80-byte + 4-Kbyte backup SRAM

Connectivity

- Camera interface
- 3x SPI, 2x I²S, 3x I²C
- Ethernet MAC 10/100 with IEEE 1588
- 2x CAN 2.0B
- SDIO
- USB 2.0 OTG FS/HS
- USB 2.0 OTG FS
- 6x USART LIN, smartcard, IrDA, Modem control

Analog

- 2-channel 2x 12-bit DAC
- 3x 12-bit ADC 24 channels / 2.4 MSPS
- Temperature sensor

Control

- 10x 16-bit timer
- 2x 16-bit motor control PWM synchronized AC timer
- 2x 32-bit timer

- Core: Arm® 32-bit Cortex®-M4 CPU with FPU, Adaptive real-time accelerator (ART Accelerator) allowing 0-wait state execution from Flash memory, frequency up to 168 MHz, memory protection unit, 210 DMIPS/ 1.25 DMIPS/MHz (Dhrystone 2.1), and DSP instructions

- Memories – 1 Mbyte of Flash memory – Up to 192+4 Kbytes of SRAM including 64-Kbyte of CCM (core coupled memory) data RAM – 512 bytes of OTP memory – Flexible static memory controller supporting Compact Flash, SRAM,PSRAM, NOR and NAND memories

- LCD parallel interface, 8080/6800 modes

- Clock, reset and supply management – 1.8 V to 3.6 V application supply and I/Os – POR, PDR, PVD and BOR – 4-to-26 MHz crystal oscillator – Internal 16 MHz factory-trimmed RC (1% accuracy) – 32 kHz oscillator for RTC with calibration – Internal 32 kHz RC with calibration

- Low-power operation – Sleep, Stop and Standby modes – VBAT supply for RTC, 20×32 bit backup registers + optional 4 KB backup SRAM

- 3×12-bit, 2.4 MSPS A/D converters: up to 24 channels and 7.2 MSPS in triple interleaved mode

- 2×12-bit D/A converters

- General-purpose DMA: 16-stream DMA controller with FIFOs and burst support

- Up to 17 timers: up to twelve 16-bit and two 32- bit timers up to 168 MHz, each with up to 4 IC/OC/PWM or pulse counter and quadrature (incremental) encoder input

- Debug mode – Serial wire debug (SWD) & JTAG interfaces – Cortex-M4 Embedded Trace Macrocell™

- Up to 140 I/O ports with interrupt capability – Up to 136 fast I/Os up to 84 MHz – Up to 138 5 V-tolerant I/Os

- Up to 15 communication interfaces – Up to 3 × I2C interfaces (SMBus/PMBus) – Up to 4 USARTs/2 UARTs (10.5 Mbit/s, ISO 7816 interface, LIN, IrDA, modem control) – Up to 3 SPIs (42 Mbits/s), 2 with muxed full-duplex I2S to achieve audio class accuracy via internal audio PLL or external clock – 2 × CAN interfaces (2.0B Active) – SDIO interface

- Advanced connectivity – USB 2.0 full-speed device/host/OTG controller with on-chip PHY – USB 2.0 high-speed/full-speed device/host/OTG controller with dedicated DMA, on-chip full-speed PHY and ULPI – 10/100 Ethernet MAC with dedicated DMA: supports IEEE 1588v2 hardware, MII/RMII

- 8- to 14-bit parallel camera interface up to 54 Mbytes/s

- True random number generator

- CRC calculation unit

- 96-bit unique ID

- RTC: subsecond accuracy, hardware calendar

In this course, we will build projects and learn how to program the microcontroller to use these features effectively for our use-cases.