STM32 Fundamentals: Hands-on Workshop Series

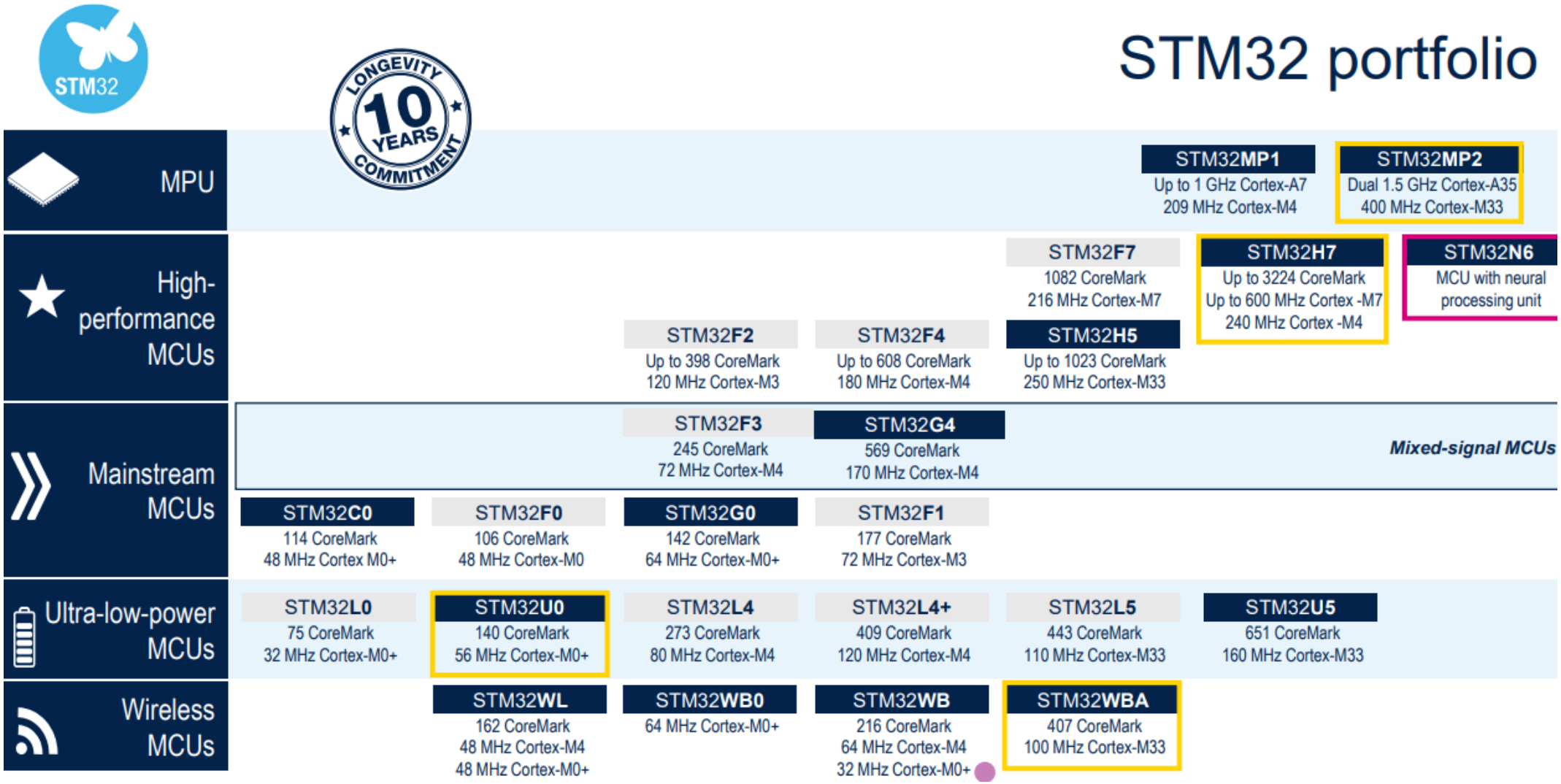
Module 3

3rd December 2024

Course Work

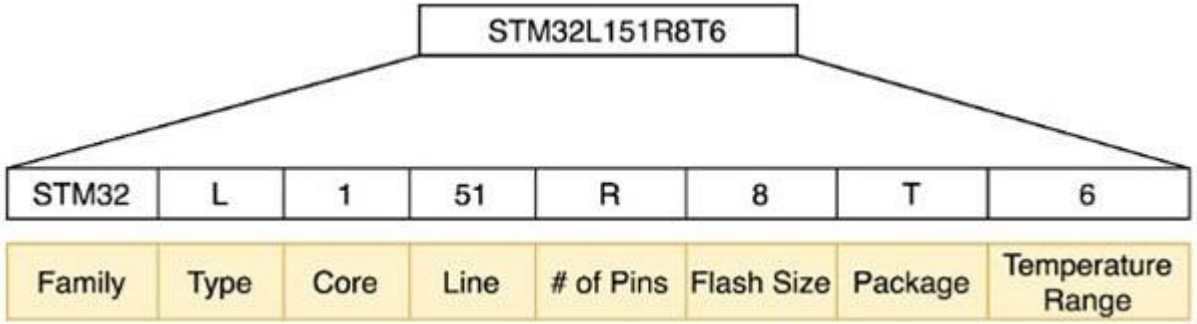
- Getting on with STM32
- More on STM32F series
- STM32 Architecture
- Memory Mapping
- Hands-On with Memory

Getting On With STM32



[CoreMark Bench Mark Source]

Getting On With STM32



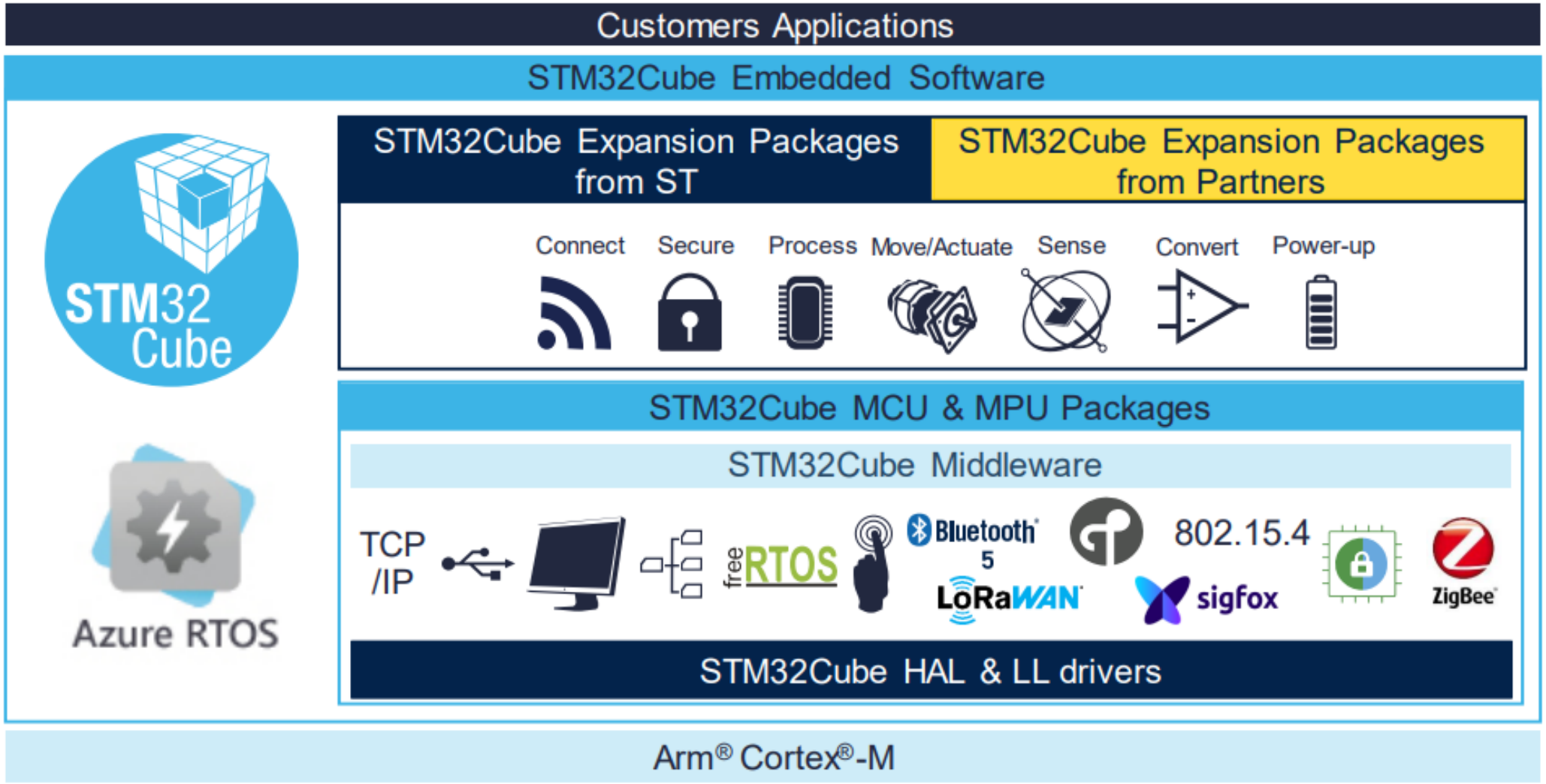
- Type
  - F – Foundation
  - G – Mainstream
  - L – Low Power
  - H – High Performance
  - W – Wireless

- Core
  - 0 – M0
  - 1,2 – M3
  - 3,4 – M4
  - 7 – M7

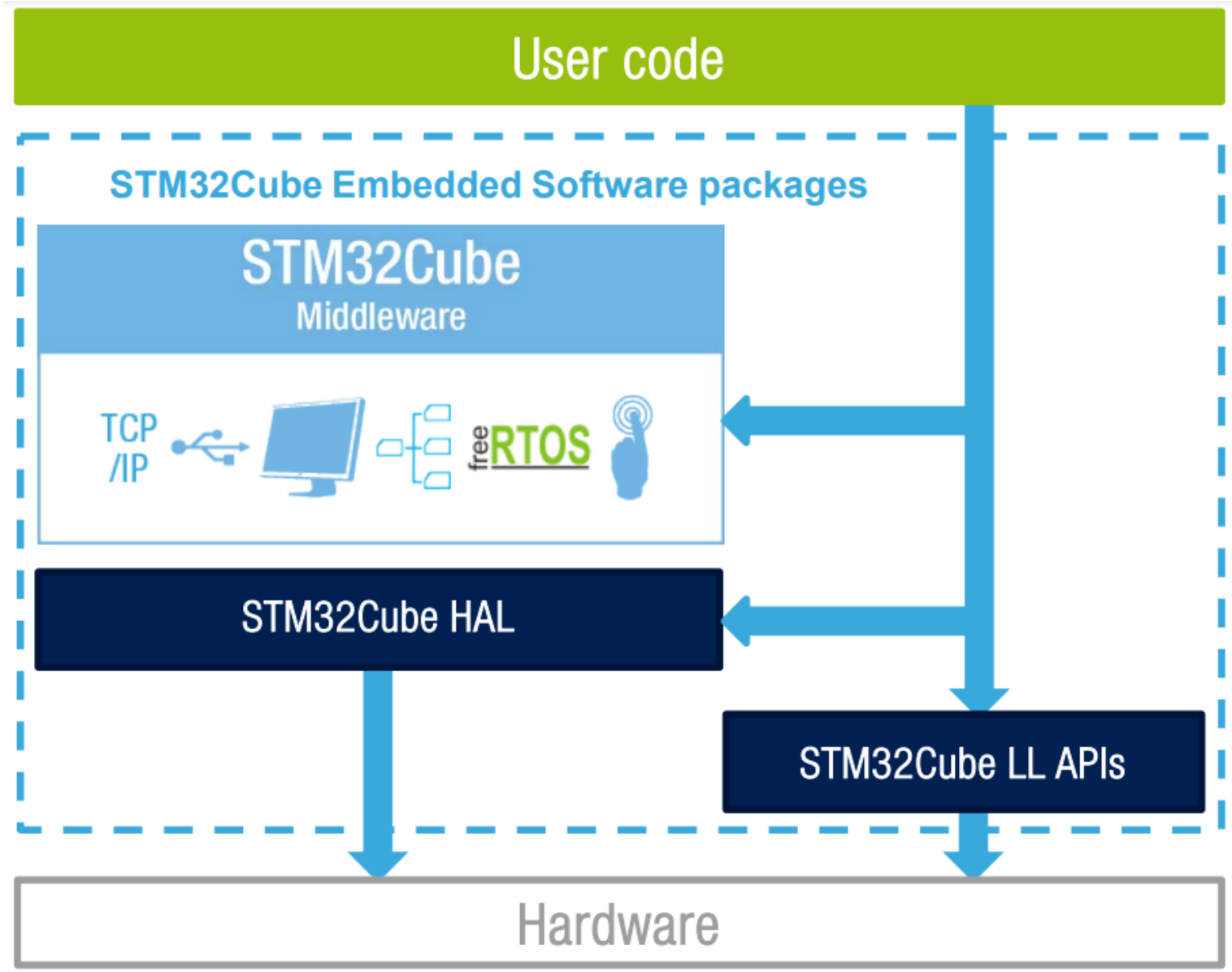
Flash-memory Size	
4	16 KByte
6	32 KByte
8	64 KByte
B	128 KByte
C	256 KByte
D	384 KByte
E	512 KByte
F	768 KByte
G	1024 KByte
H	1536 KByte
I	2048 KiB

Number of Pins	
F	20
G	28
K	32
T	36
S	44
C	48
R	64 or 66
V	100
Z	144
I	176

Getting On With STM32



Getting On With STM32



STM32 Architecture

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RM0368
Reference manual

STM32F401xB/C and STM32F401xD/E
advanced Arm®-based 32-bit MCUs

Introduction

This Reference manual targets application developers. It provides complete information on how to use the memory and the peripherals of the STM32F401xB/C and STM32F401xD/E microcontrollers.

STM32F401xB/C and STM32F401xD/E are part of the STM32F401xx family of microcontrollers with different memory sizes, packages and peripherals.

For ordering information, mechanical and electrical device characteristics refer to the datasheets.

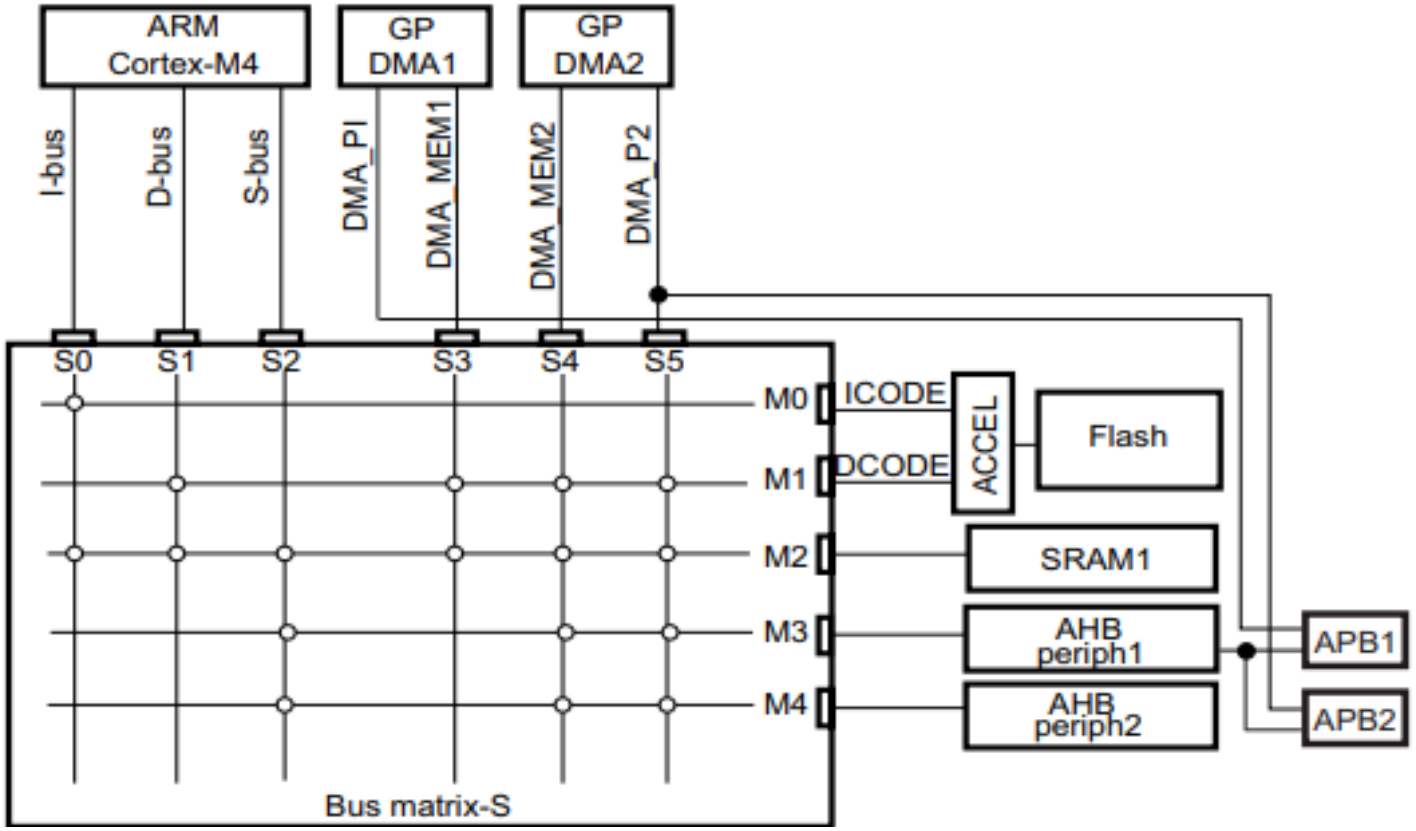
For information on the Arm® Cortex®-M4 with FPU core, refer to the *Cortex®-M4 with FPU Technical Reference Manual*.

Related documents

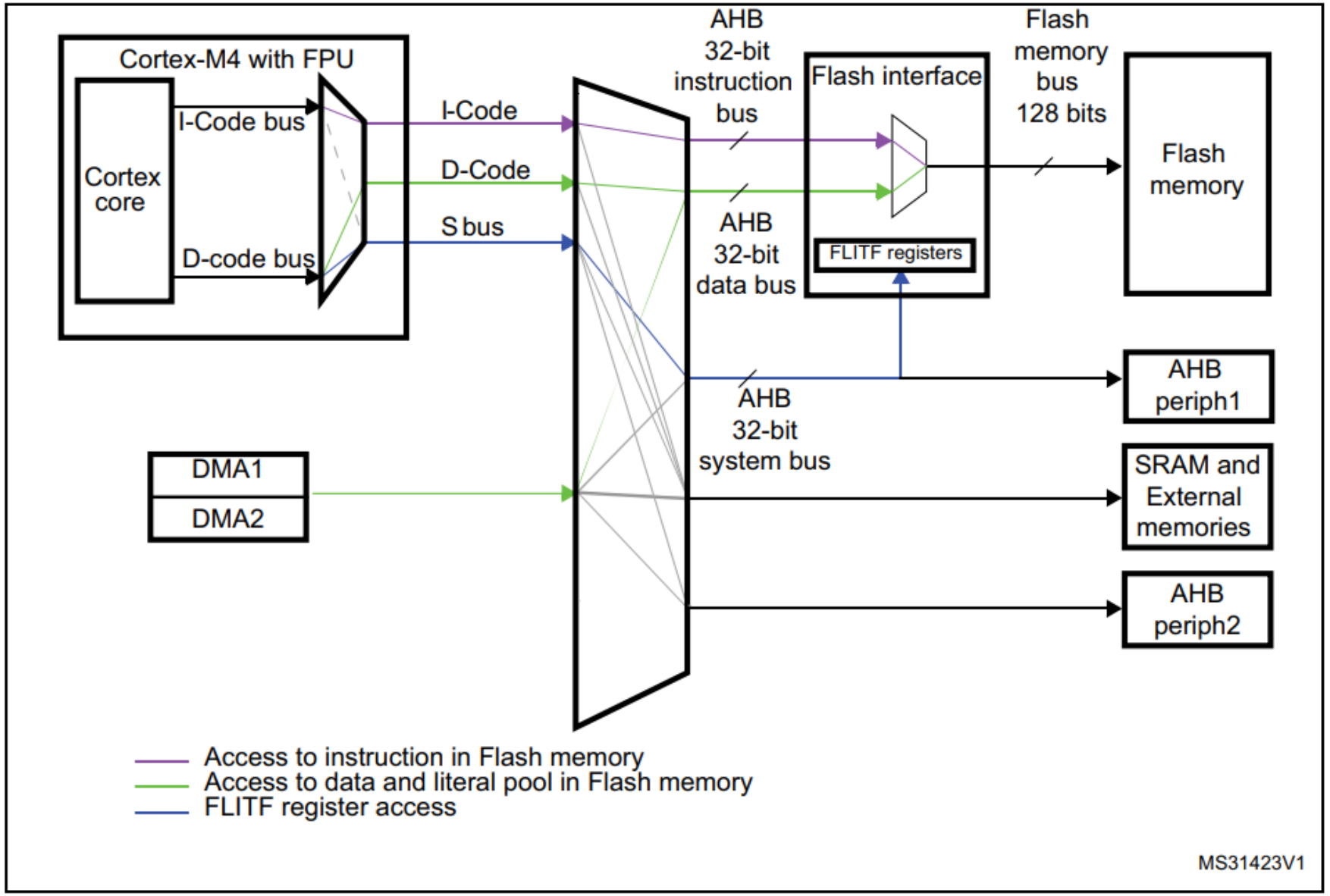
Available from STMicroelectronics web site (*http://www.st.com*):

- STM32F401xB/C datasheet
- STM32F401xD/E datasheet
- For information on the Arm®-M4 core with FPU, refer to the *STM32F3xx/F4xxx Cortex®-M4 with FPU-M4 programming manual (PM0214)*.

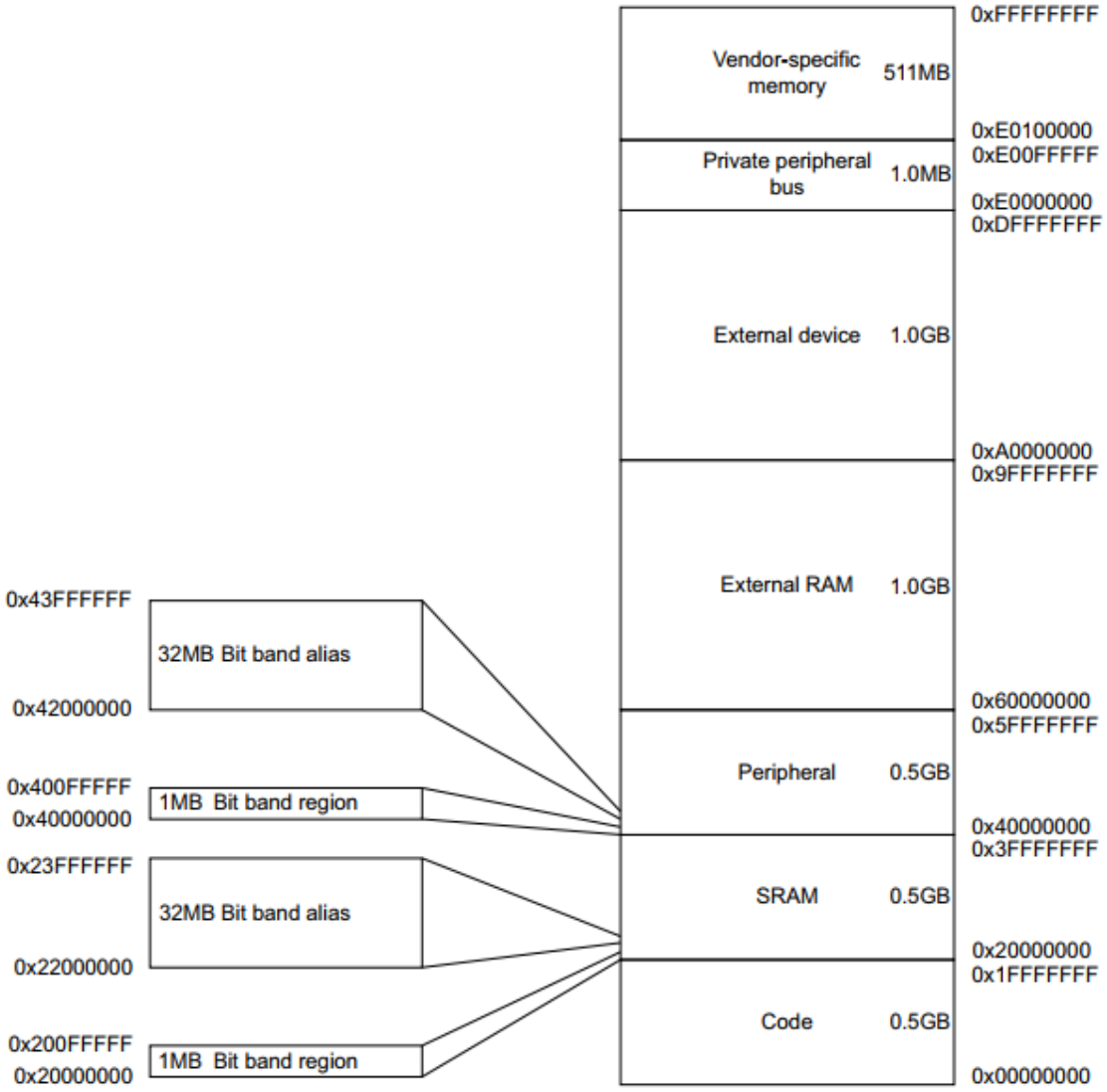
STM32 Architecture



STM32 Architecture



STM32 Architecture - *Memory Mapping*



STM32 Architecture - *Memory Mapping*

Binary vs. decimal data measurements

BINARY SYSTEM		
NAME	FACTOR	VALUE IN BYTES
kibibyte (KiB)	2^{10}	1,024
mebibyte (MiB)	2^{20}	1,048,576
gibibyte (GiB)	2^{30}	1,073,741,824
tebibyte (TiB)	2^{40}	1,099,511,627,776
pebibyte (PiB)	2^{50}	1,125,899,906,842,624
exbibyte (EiB)	2^{60}	1,152,921,504,606,846,976
zebibyte (ZiB)	2^{70}	1,180,591,620,717,411,303,424
yobibyte (YiB)	2^{80}	1,208,925,819,614,629,174,706,176

DECIMAL SYSTEM		
NAME	FACTOR	VALUE IN BYTES
kilobyte (KB)	10^{3}	1,000
megabyte (MB)	10^{6}	1,000,000
gigabyte (GB)	10^{9}	1,000,000,000
terabyte (TB)	10^{12}	1,000,000,000,000
petabyte (PB)	10^{15}	1,000,000,000,000,000
exabyte (EB)	10^{18}	1,000,000,000,000,000,000
zettabyte (ZB)	10^{21}	1,000,000,000,000,000,000,000
yottabyte (YB)	10^{24}	1,000,000,000,000,000,000,000,000

Thynk Loop

Memory Architecture & Mapping

To The Manual

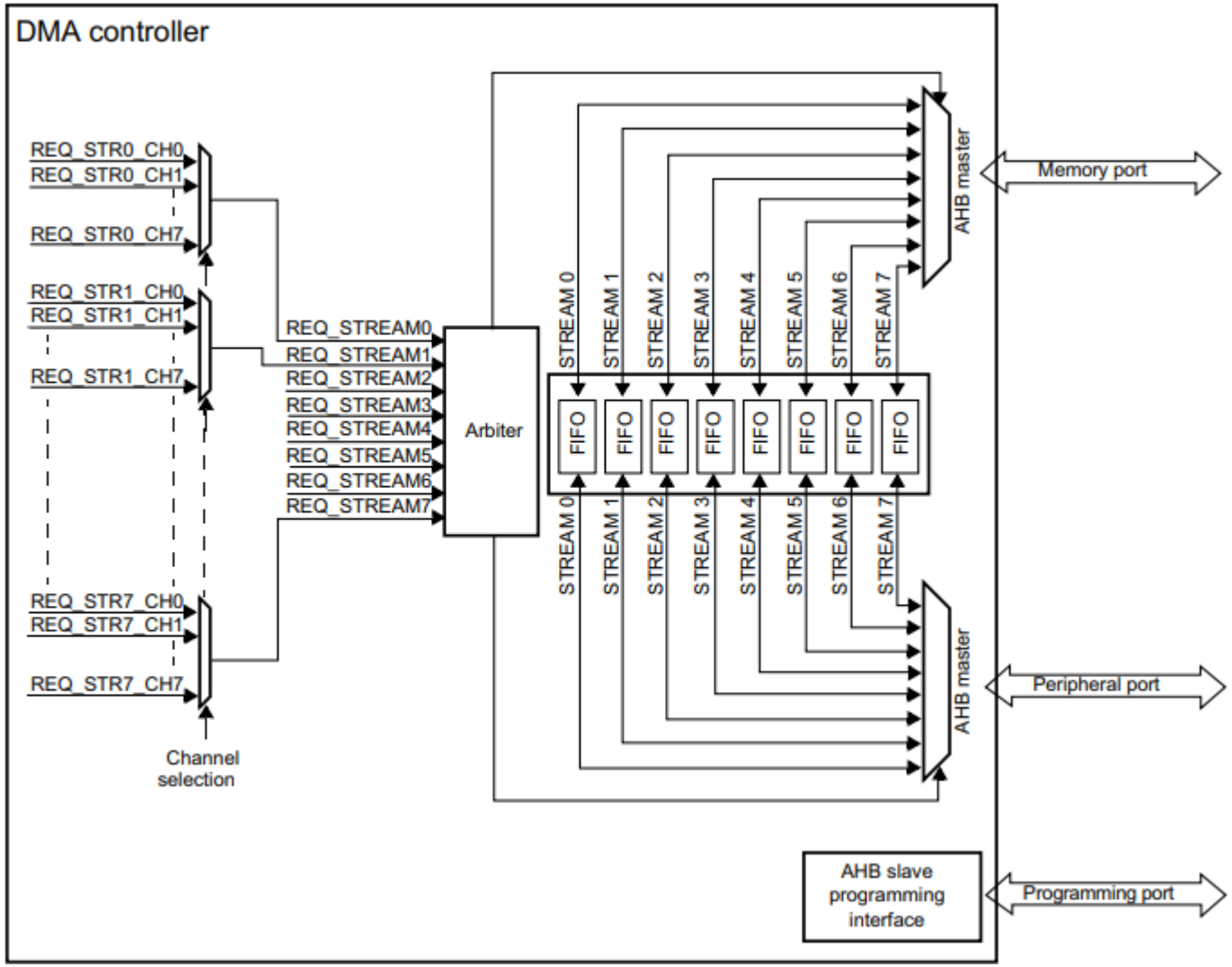
STM32 Architecture

Low-Power Mode

Mode name	Entry	Wakeup	Effect on 1.2 V domain clocks	Effect on V_{DD} domain clocks	Voltage regulator
Sleep (Sleep now or Sleep-on-exit)	WFI or Return from ISR	Any interrupt	CPU CLK OFF no effect on other clocks or analog clock sources	None	ON
	WFE	Wakeup event			
Stop	PDDS bit + STOP mode configuration + SLEEPDEEP bit + WFI, Return from ISR or WFE	Any EXTI line (configured in the EXTI registers, internal and external lines)	All 1.2 V domain clocks OFF	HSI and HSE oscillators OFF	Main regulator or Low-Power regulator (depends on *PWR power control register (PWR_CR)*
Standby	PDDS bit + SLEEPDEEP bit + WFI, Return from ISR or WFE	WKUP pin rising edge, RTC alarm (Alarm A or Alarm B), RTC Wakeup event, RTC tamper events, RTC time stamp event, external reset in NRST pin, IWDG reset			OFF

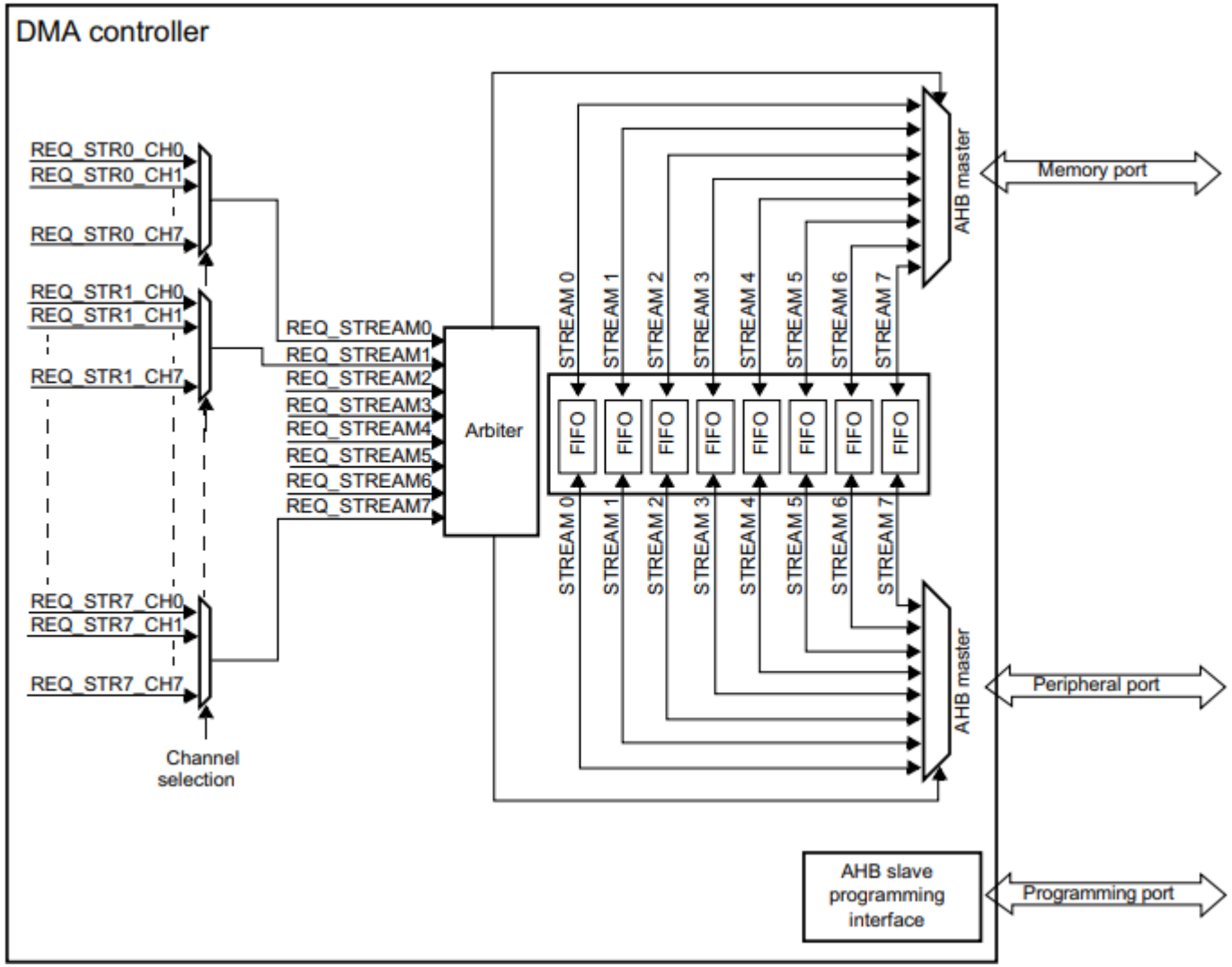
STM32 Architecture

DMA



STM32 Architecture

DMA



STM32 Architecture

DMA

To The Manual

Programmer's Manual

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PM0214
Programming manual

STM32 Cortex®-M4 MCUs and MPUs programming manual

Introduction

This programming manual provides information for application and system-level software developers. It gives a full description of the STM32 Cortex®-M4 processor programming model, instruction set and core peripherals. The applicable products are listed in the table below.

The Cortex®-M4 processor used in STM32F3 Series, STM32F4 Series, STM32G4 Series, STM32H745/755 and STM32H747/757 Lines, STM32L4 Series, STM32L4+ Series, STM32WB Series, STM32WL Series and STM32MP1 Series, is a high performance 32-bit processor designed for the microcontroller and microprocessor market. It offers significant benefits to developers, including:

- Outstanding processing performance combined with fast interrupt handling
- Enhanced system debug with extensive breakpoint and trace capabilities
- Efficient processor core, system and memories
- Ultra-low power consumption with integrated sleep modes
- Platform security

Table 1. Applicable products

Type	Product Series and Lines
Microcontrollers	STM32F3 Series, STM32F4 Series, STM32G4 Series, STM32L4 Series, STM32L4+ Series, STM32WB Series, STM32WL Series STM32H745/755 and STM32H747/757 Lines