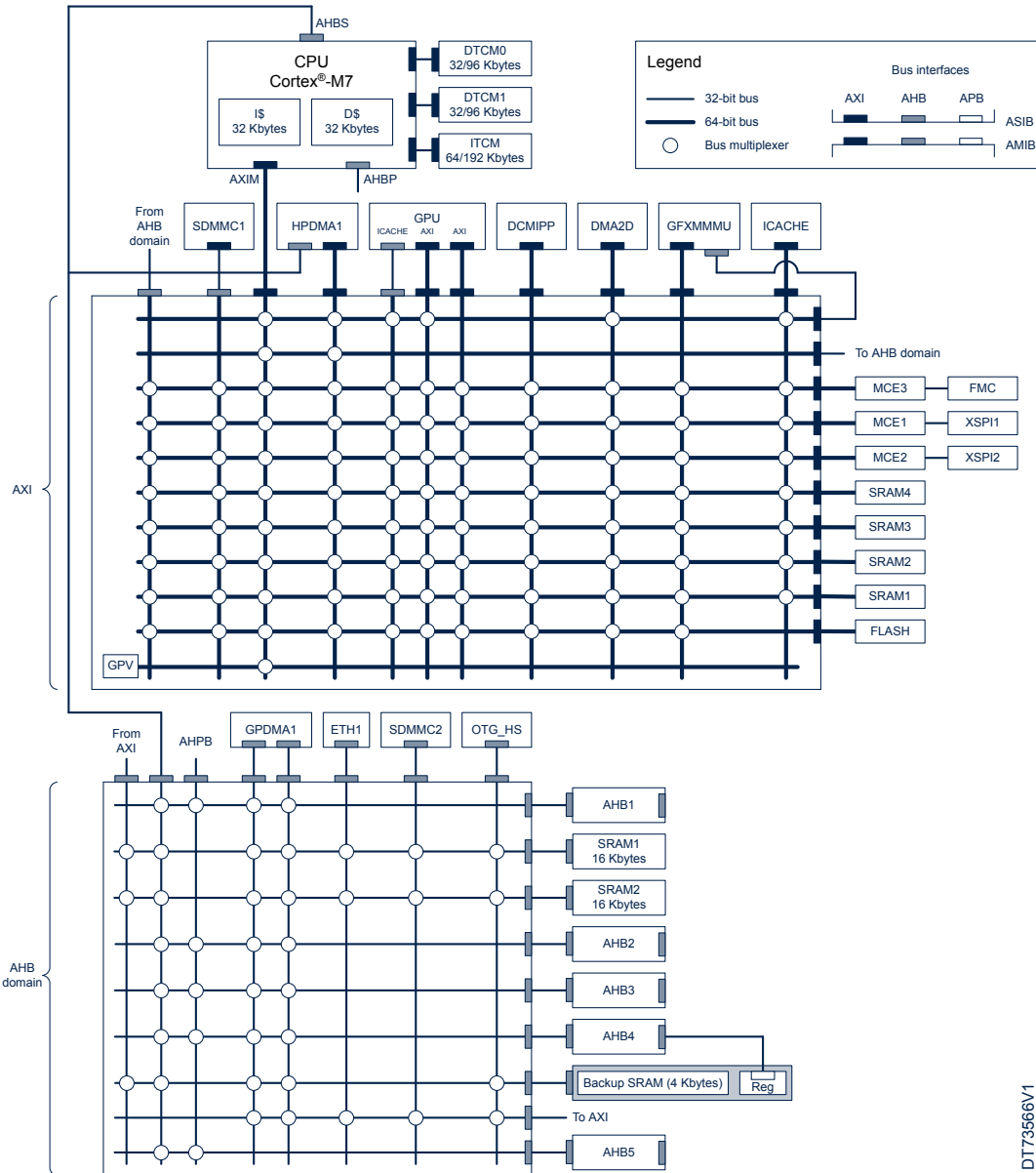


STM32H7Rx/7Sx performance software expansion for STM32Cube



DT73566V1

Product status link

X-CUBE-PERF-H7RS



Features

- STM32H7Rx/7Sx performance demonstrator
- Code execution and data storage in different memory locations
- Bandwidth measurement for sequential and nonsequential transfer to and from external memories
- Arm® Cortex®-M7 processor
- Instruction cache (ICACHE)
- Data cache (DCACHE)
- Memory cipher engine (MCE) impact on execution and bandwidth
- AXI and AHB bus matrices

Description

The X-CUBE-PERF-H7RS Expansion Package aims to demonstrate the performance of the STM32H7Rx/7Sx architecture with its Arm® Cortex®-M7 able to run at up to 600 MHz. The core instruction and data caches unleash its performance with zero-wait-state-like execution from different memories. The memories can be either internal or external. The core can access them through the TCM or AXIM buses, with or without encryption.

The Expansion Package is provided with two projects, each including several configurations for the STM32H7S78-DK Discovery kit:

- The FFT project demonstrates the cycles needed for the calculation, in the frequency domain, of the maximum energy of a sine wave input signal. The demonstration uses complex FFT, complex magnitude, and maximum functions.
- The bandwidth project demonstrates the STM32H7Rx/7Sx bandwidth performance for data transfer between internal memories or between internal and external memories.

An FFT use case (provided by the CMSIS library) is proposed as an example with two toolchains: Keil® (MDK-ARM) and IAR Systems® (EWARM).

Each configuration allows the execution of application code and data storage in different memory locations according to the chosen configuration.

When the instruction and data caches are enabled, the firmware results demonstrate that performance is similar when the code execution or data storage uses internal or external memories located in different domains. The results also highlight the impact of the MCE usage both on the cycles needed and bandwidth.

The bandwidth benchmark is proposed with three toolchains: Keil® (MDK-ARM), IAR Systems® (EWARM), and STMicroelectronics (STM32CubeIDE). The bandwidth is measured:

- For read and write from and to the external PSRAM, either for sequential or nonsequential transfer according to the selected configuration
- For read from the external flash memory, either for sequential or nonsequential transfer according to the selected configuration

An AXI-SRAM to AXI-SRAM transfer bandwidth is also measured.

For more details, refer to the *Introduction to STM32H7Rx/7Sx system architecture and performance* application note (AN6062).

1 General information

The X-CUBE-PERF-H7RS Expansion Package runs on the STM32H7Rx/7Sx microcontrollers based on the Arm® Cortex®-M7 processor.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.



1.1 Ordering information

X-CUBE-PERF-H7RS is available for free download from the www.st.com website.

1.2 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to improve designer productivity significantly by reducing development effort, time, and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from conception to realization, among which are:
 - [STM32CubeMX](#), a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
 - [STM32CubeIDE](#), an all-in-one development tool with peripheral configuration, code generation, code compilation, and debug features
 - [STM32CubeCLT](#), an all-in-one command-line development toolset with code compilation, board programming, and debug features
 - STM32CubeProgrammer ([STM32CubeProg](#)), a programming tool available in graphical and command-line versions
 - STM32CubeMonitor ([STM32CubeMonitor](#), [STM32CubeMonPwr](#), [STM32CubeMonRF](#), [STM32CubeMonUCPD](#)), powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real time
- [STM32Cube MCU and MPU Packages](#), comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeH7RS for the STM32H7Rx/7Sx microcontrollers), which include:
 - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
 - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over hardware
 - A consistent set of middleware components such as RTOS, FAT file system, TCP/IP, USB Host and Device, USB-PD, OpenBL, external memory loader and manager, and MCUboot
 - All embedded software utilities with full sets of peripheral and applicative examples
- [STM32Cube Expansion Packages](#), which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with:
 - Middleware extensions and applicative layers
 - Examples running on some specific STMicroelectronics development boards



2 License

X-CUBE-PERF-H7RS is delivered under the [SLA0048](#) software license agreement and its Additional License Terms.

Revision history

Table 1. Document revision history

Date	Revision	Changes
18-Apr-2024	1	Initial release.

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