DFSDM internal peripheral

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Contents

1 Article purpose

The purpose of this article is to

- briefly introduce the DFSDM peripheral and its main features
- indicate the level of security supported by this hardware block
- explain how each instance can be allocated to the three runtime contexts and linked to the corresponding software components
- explain, when needed, how to configure the DFSDM peripheral.

2 Peripheral overview

The **DFSDM** peripheral (Digital Filter for Sigma-Delta Modulator) is used as a generic ADC. It benefits from external analog frontend interfaces and internal digital filters.

It can be used in various applications[1] such as: **audio record** with MEMS microphones, **energy measurement** with STPMS2[2] for electricity meters or motor control...

2.1 Features

The **DFSDM** peripheral provides several features, among which:

- Up to 8 external analog frontend serial interfaces (SPI, manchester coded single wire interface, clock output), for various sigma-delta modulators
- Up to 8 internal digital parallel interfaces (from internal ADC[3] or memory data stream via DMA[4] or CPU)
- Up to 6 digital filters, that offers up to 24-bit final ADC resolution
- Conversions that can be launched continuously, or using various triggers: by software, TIM[5], LPTIM[6], EXTI[7] or synchronously with DFSDM filter 0
- Event detectors: analog watchdog high/low thresholds, short-circuit detector, extremes detector
- Break generation to TIM[5] on analog watchdog or short-circuit detector events

Refer to STM32MP15 reference manuals for the complete features list, and to the software components, introduced below, to know which features are really implemented.

2.2 Security support

The DFSDM is a **non-secure** peripheral.

3 Peripheral usage and associated software

3.1 Boot time

The DFSDM is not used at boot time.

3.2 Runtime

3.2.1 Overview

The DFSDM can be allocated to:

- the Arm®Cortex®-A7 non-secure core to be used under Linux® with the IIO or ALSA framework

or

- the Arm®Cortex®-M4 for using in STM32Cube with STM32Cube DFSDM driver.

The peripheral assignment chapter describes which peripheral instance can be assigned to which context.

3.2.2 Software frameworks

Domain	Peripheral	Software components			Comment
OP-TEE	Linux	STM32Cube			
Analog	DFSDM		Linux IIO framework Linux ALSA framework	STM32Cube DFSDM driver	

3.2.3 Peripheral configuration

The configuration is applied by the firmware running in the context to which the peripheral is assigned. The configuration by itself can be performed via the STM32CubeMX tool for all internal peripherals. It can then be manually completed (especially for external peripherals) according to the information given in the corresponding software framework article.

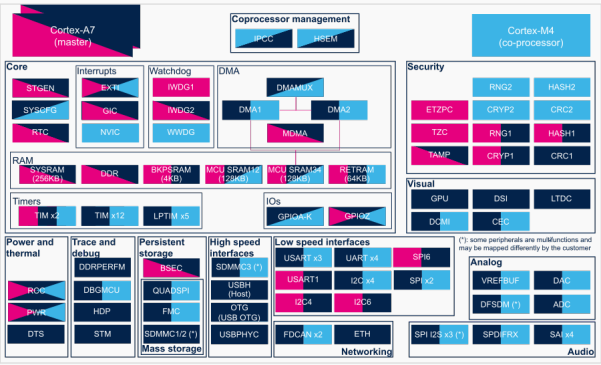
For the Linux kernel configuration, please refer to DFSDM device tree configuration and DFSDM Linux driver articles.

3.2.4 Peripheral assignment

Check boxes illustrate the possible peripheral allocations supported by STM32 MPU Embedded Software:

- means that the peripheral can be assigned () to the given runtime context.
- is used for system peripherals that cannot be unchecked because they are statically connected in the device.

Refer to How to assign an internal peripheral to a runtime context for more information on how to assign peripherals manually or via STM32CubeMX.
The present chapter describes STMicroelectronics recommendations or choice of implementation. Additional possiblities might be described in STM32MP15 reference manuals.



Internal peripherals

Domain	Peripheral	Runtime allocation				Comment
Instance	Cortex-A7 secure (OP-TEE)	Cortex-A7 non-secure (Linux)	Cortex-M4 (STM32Cube)			
Analog	DFSDM	DFSDM				Assignment (single choice)

4 How to go further

See:

- *STM32L4 System Digital Filter for SD Modulators interface*[1], online DFSDM training with application examples from STMicroelectronics
- *Getting started with sigma-delta digital interface*[8], application note from STMicroelectronics

5 References

- 1.01.1 STM32L4 System Digital Filter for SD Modulators interface, online DFSDM training from STMicroelectronics
- STPMS2 "Smart sensor" device
- ADC internal peripheral
- DMA internal peripheral
- 5.05.1 TIM internal peripheral
- LPTIM internal peripheral
- EXTI internal peripheral
- Getting started with sigma-delta digital interface, application note from STMicroelectronics

Digital Filter for Sigma-Delta Modulator

Analog-to-digital converter. The process of converting a sampled analog signal to a digital code that represents the amplitude of the original signal sample.

Serial Peripheral Interface

Direct Memory Access

Central processing unit

low-power timer (STM32 specific)

External Interrupt

Open Portable Trusted Execution Environment