

---

## Contents

---

## VREFBUF internal peripheral

**Contents**

<b>1</b>	<b>Article purpose</b> .....	<b>3</b>
<b>2</b>	<b>Peripheral overview</b> .....	<b>4</b>
2.1	Features .....	4
2.2	Security support .....	4
<b>3</b>	<b>Peripheral usage and associated software</b> .....	<b>5</b>
3.1	Boot time .....	5
3.2	Runtime .....	5
3.2.1	Overview .....	5
3.2.2	Software frameworks .....	5
3.2.3	Peripheral configuration .....	5
3.2.4	Peripheral assignment .....	6
<b>4</b>	<b>References</b> .....	<b>7</b>

## 1 Article purpose

---

The purpose of this article is to

- briefly introduce the VREFBUF 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 VREFBUF peripheral.

## 2 Peripheral overview

---

The VREFBUF peripheral is an internal voltage regulator.

### 2.1 Features

The VREFBUF is supplied via the VDDA pin. When enabled, it can provide a reference voltage in the range of: 1,5V, 1,8V, 2,048V or 2,5V.

The VREFBUF can be used to provide an analog voltage reference for:

- ADC internal peripheral<sup>[1]</sup>
- DAC internal peripheral<sup>[2]</sup>
- External components through the dedicated VREF+ pin.

The VREFBUF can be left unused. In this case, an external voltage regulator can provide reference voltage to VREF+ pin.

Refer to the [STM32MP15 reference manuals](#) for the complete list of features, and to the software components, introduced below, to know which features are really implemented.

### 2.2 Security support

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

## 3 Peripheral usage and associated software

### 3.1 Boot time

The VREFBUF is usually not used at boot time. But it may be needed by the SSBL (see [Boot chains overview](#)), to supply the internal ADC<sup>[1]</sup> for example.

### 3.2 Runtime

#### 3.2.1 Overview

The VREFBUF can be allocated to the Arm<sup>®</sup>Cortex<sup>®</sup>-A7 non-secure to be used under Linux<sup>®</sup> with regulator framework<sup>[3]</sup>.

#### Information

The VREFBUF is a system resource<sup>[4]</sup> which needs to be also controlled by the resource manager<sup>[4]</sup> in case its consumers (e.g. ADC<sup>[1]</sup>, DAC<sup>[2]</sup> or an external device connected to VREF+ pin) are spread across:

- the Arm<sup>®</sup>Cortex<sup>®</sup>-A7 non-secure context
- the Arm<sup>®</sup>Cortex<sup>®</sup>-M4 context

For this reason, the direct control of VREFBUF from the Arm<sup>®</sup>Cortex<sup>®</sup>-M4 is not recommended in STM32Cube<sup>[5]</sup> by default.

It's recommended to implement it in STM32Cube **only if** all consumers and the VDDA supply pin are controlled in the Arm<sup>®</sup>Cortex<sup>®</sup>-M4 context.

The [Peripheral assignment](#) chapter describes which peripheral instance can be assigned to which context.

#### 3.2.2 Software frameworks

Domain	Peripheral	Software frameworks	Comment
Cortex-A7 secure (OP-TEE)	Cortex-A7 non-secure (Linux)	Cortex-M4 (STM32Cube)	
Analog	VREFBUF		Linux <a href="#">regulator framework</a>

#### 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 [device internal regulator](#). An example can be found also in [ADC DT configuration example](#)

- In case the control of VREFBUF consumers are spread across the various cores, see also [Resource manager for coprocessing](#)

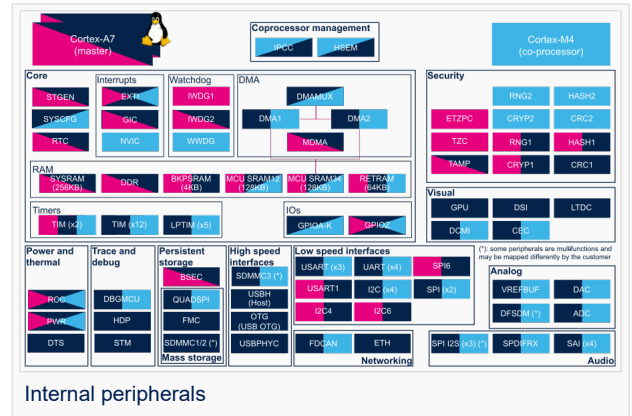
### 3.2.4 Peripheral assignment

**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 possibilities might be described in [STM32MP15 reference manuals](#).



Domain	Peripheral	Runtime allocation		Comment
Instance	Cortex-A7 secure (OP-TEE)	Cortex-A7 non-secure (Linux)	Cortex-M4 (STM32Cube)	
Analog	VREFBUF	VREFBUF		<input type="checkbox"/> Assignment (single choice)

## 4 References

---

- [↑ 1.01.11.2 ADC internal peripheral](#)
- [↑ 2.02.1 DAC internal peripheral](#)
- [↑ Regulator overview, Linux<sup>®</sup> regulator framework overview](#)
- [↑ 4.04.1 Resource manager for coprocessing, focus on system resources](#)
- [↑ STM32CubeMP1 architecture](#)

**IMPORTANT NOTICE – READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to [www.st.com/trademarks](http://www.st.com/trademarks). All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2023 STMicroelectronics – All rights reserved