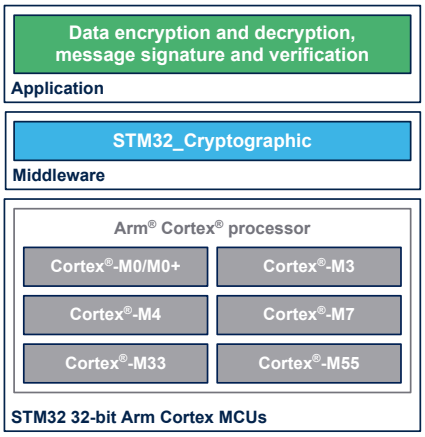
X-CUBE-CRYPTOLIB

Data brief

STM32 cryptographic library software expansion for STM32Cube



Product status
X-CUBE-CRYPTOLIB

Features

Cipher encryption and decryption

- AES: CBC, CCM, CFB, CTR, ECB, GCM, OFB, XTS, KeyWrap
- SM4: CBC, CFB, CTR, ECB, OFB
- Chacha-Poly1305

Digest generation

- SHA-1
- SHA-2: SHA-224, SHA-256, SHA-384, SHA-512, SHA-512/224, SHA-512/256
- SHA-3: SHA3-224, SHA3-256, SHA3-384, SHA3-512
- SM3
- SHAKE

Message authentication code (MAC) generation

- HMAC:
  - SHA-1
  - SHA-2: SHA-224, SHA-256, SHA-384, SHA-512, SHA-512/224, SHA-512/256
  - SM3
- AES: CMAC
- KMAC: SHAKE

Elliptic curves key generation, signature, and verification

- Elliptic-curve digital signature algorithm (ECDSA): NIST-R (P-224, P-256, P-384, P-521), NIST-K P-256, BRAINPOOL R/T (P-160, P-192, P-224, P-256, P-320, P-384, P-512), ANSSI P-256
- Edwards-curve digital signature algorithm (EdDSA): Ed448, Ed25519
- SM2 digital signature algorithm: OSCCA 256-bits curve

Elliptic curves Diffie-Hellman key exchange

- Curve448, curve25519
- NIST-R (P-224, P-256, P-384, P-521), NIST-K P-256, BRAINPOOL R/T (P-160, P-192, P-224, P-256, P-320, P-384, P-512), ANSSI P-256

RSA signature, verification, encryption, and decryption

- PKCS#1 v1.5 and v2.2
- Chinese remainder theorem (CRT) key representation
- Hash method:
  - SHA-1
  - SHA-2: SHA-224, SHA-256, SHA-384, SHA-512, SHA-512/224, SHA-512/256

Deterministic random bit generator (DRBG)

- CTR-DRBG

1 Description

The STM32 cryptographic library package (X-CUBE-CRYPTOLIB) includes all the major security algorithms for encryption, hashing, message authentication, and digital signing, enabling developers to satisfy application requirements for any combination of data integrity, confidentiality, identification/authentication, and non-repudiation.

The library includes firmware functions for the STM32 microcontrollers of the STM32F0 series, STM32F1 series, STM32F2 series, STM32F3 series, STM32F4 series, STM32F7 series, STM32G0 series, STM32G4 series, STM32H5 series, STM32H7 series, STM32L0 series, STM32L1 series, STM32L4 series, STM32L4+ series, STM32L5 series, STM32N6 series, STM32U0 series, STM32U3 series, STM32U5 series, STM32WBA series, STM32WB series, and STM32WL series including the STM32WL3x line depending on their Arm® Cortex®-M processor. For more details, refer to the *STM32 cryptographic library* dedicated pages of the STM32 MCU wiki at wiki.st.com/stm32mcu.

Most of the well-used algorithms are certified according to the NIST cryptographic algorithm validation program (CAVP), helping customers to prove quickly and cost-effectively the security of their new products.

Full details are available online at the NIST CSRC algorithm validation lists website, selecting the CAVP web page.

This package contains examples for each algorithm for popular development tools including IAR Systems® EWARM (IAR Embedded Workbench®), Keil® MDK-ARM, and GCC-based IDEs such as STMicroelectronics STM32CubeIDE.

To benefit from STM32 cryptographic accelerators, refer to the STM32Cube MCU and MPU package hardware abstraction layer (HAL) functions and examples.

2 General information

The X-CUBE-CRYPTOLIB runs on STM32 microcontrollers based on Arm® Cortex® cores.

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

2.1 Ordering information

X-CUBE-CRYPTOLIB is available for free download from the *www.st.com* website.

2.2 NIST algorithm validation lists

Refer to Table 1 for access to the certification listing on the National Institute of Standards and Technology (NIST) portal.

Table 1. NIST CSRC algorithm validation lists

Cortex® architecture	Optimization type	CAVP link
Cortex®-M0/M0+	Size	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13549
Cortex®-M0/M0+	Speed	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13550
Cortex®-M3	Size	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13546
Cortex®-M3	Speed	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13547
Cortex®-M4	Size	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13544
Cortex®-M4	Speed	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13545
Cortex®-M7	Size	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13542
Cortex®-M7	Speed	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13543
Cortex®-M33	Size	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13548
Cortex®-M33	Speed	csrc.nist.gov/projects/cryptographic-algorithm-validation-program/details?product=13493
Cortex®-M55	Size	Certification ongoing
Cortex®-M55	Speed	Certification ongoing

2.3 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 STM32CubeN6 for the STM32N6 series), 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 ThreadX, FileX, LevelX, NetX Duo, USBX, USB PD, video encoder API, and OpenBL
  - 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

3 License

X-CUBE-CRYPTOLIB is delivered under the SLA0048 software license agreement and its Additional License Terms.

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
01-Sep-2015	1	Initial release.
09-Dec-2015	2	Updated *Features* and *Description* to introduce a new cryptographic firmware version.
15-Dec-2015	3	Updated *Description* and *Section 2: Ordering information*.
07-Jul-2016	4	Updated *Features* and *Description* to introduce the list of certified algorithms.
20-Nov-2020	5	Extended the document scope to the STM32WL Series. Added the *Product information* and *License* sections and the cover picture. Updated *Description*.
12-Jan-2021	6	Updated the document title. Updated in *Product information* the versions for the STM32F0 Series, STM32G0 Series, STM32L0 Series, STM32L5 Series and STM32WL Series.
14-May-2021	7	Extended the number of security algorithms in STM32 cryptographic library with full NIST validation according to the Arm® Cortex®-M processor: • Updated the cover picture • Updated *Features* and *Description* • Added *NIST algorithm validation lists* Updated *License*. Removed *Product information*.
21-Jul-2021	8	Extended the document scope to the STM32U5 Series: updated *Description*. Updated *License* with the Additional License Terms.
09-Mar-2023	9	Extended the document scope to the STM32H5 series and STM32WBA series: updated *Description*. Updated *What is STM32Cube?*
16-May-2024	10	Extended the document scope to the STM32U0 series and to the STM32H7Rx/7Sx microcontrollers in the STM32H7 series: updated *Description*. Updated *What is STM32Cube?*
28-Feb-2025	11	Extended the document scope to the STM32WL3x product line in the STM32WL series: updated *Description*. Updated *What is STM32Cube?*
17-Apr-2025	12	Extended the document scope to the STM32U3 series: updated *Description*. Updated *What is STM32Cube?*
09-Oct-2025	13	Extended the document scope to the STM32N6 series: updated Description, NIST algorithm validation lists, and the cover image. Updated Features and What is STM32Cube?

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