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# STM32H7R/S high-performance lines

**Scalable & secure bootflash  
microcontrollers**





# The STM32 portfolio

## Five product categories



Wireless  
MCU

Short- and long-range connectivity



Ultra-low-power  
MCU

32-bit general-purpose microcontrollers: from 75 to 3,224 CoreMark score



Mainstream  
MCU



High-performance  
MCU



Embedded  
MPU

32- and 64-bit microprocessors



Enabling edge AI solutions



Scalable security

# STM32H7 portfolio

now over 170 part numbers



## Bootflash Line

### STM32H7R3/7S3

600 MHz  
1284 DMIPS  
SRAM 620 KB  
64K user flash  
128K ST-iRoT  
Chrom-ART

### STM32H7R7/7S7

600 MHz  
1284 DMIPS  
SRAM 620 KB  
64K user flash  
128K ST-iRoT  
NeoChrom



## Dual-core Line

### STM32H745/755

480 + 240 MHz  
1027 + 300 DMIPS  
RAM 1 MB  
Flash up to 2 MB

### STM32H747/757

480 + 240 MHz  
1027 + 300 DMIPS  
RAM 1 MB  
Flash up to 2 MB



## Single-core Line

### STM32H7A3/B3

280 MHz  
599 DMIPS  
RAM 1.4 MB  
Flash up to 2 MB

### STM32H742

480 MHz  
1027 DMIPS  
RAM 692 KB  
Flash up to 2 MB

### STM32H743/753

480 MHz  
1027 DMIPS  
RAM 1 MB  
Flash up to 2 MB

### STM32H723/733

550 MHz  
1177 DMIPS  
RAM 564 KB  
Flash up to 1 MB

### STM32H725/735

550 MHz  
1177 DMIPS  
RAM 564 KB  
Flash up to 1 MB



## Value Line

### STM32H7B0

280 MHz  
599 DMIPS  
RAM 1.4 MB  
Flash 128 KB

### STM32H750

480 MHz  
1027 DMIPS  
RAM 1 MB  
Flash 128 KB

### STM32H730

550 MHz  
1177 DMIPS  
RAM 564 BB  
Flash 128 KB

Arm® Cortex® core

Cortex®-M7

Cortex®-M7 & -M4

## Opening new innovation possibilities with scalable and secure bootflash-microcontrollers

**General-purpose MCU lines**

**STM32H7R3/S3**

**Graphics MCU lines**

**STM32H7R7/S7**



**Run MPU-like applications  
on a real-time MCU**

**Leverage more design  
freedom**

**Fast-track your  
development with MCU  
ecosystem**



# What the STM32H7R/S lines offer

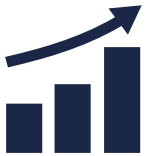
## Max performance: 600 MHz bootflash MCU

- Real-time execution from internal or external memories
- High speed serial & parallel memory interfaces up to 200 MHz DTR
- Large internal SRAM



## High scalability to optimize your design & reduce costs

- Flexible external memory capacity
- 10 packages: from cost-effective 68 to 225 pins



## Security assurance: ready for future security directives

- Target security certification: SESIP Level 3 and PSA certified L3.
- On-the-fly decrypt/encrypt & secure boot



## Best-in-class platform for graphics applications

- Powerful 2.5D NeoChrom GPU - smart DMA architecture memory/GPU
- Enabling UIs with HD resolution.

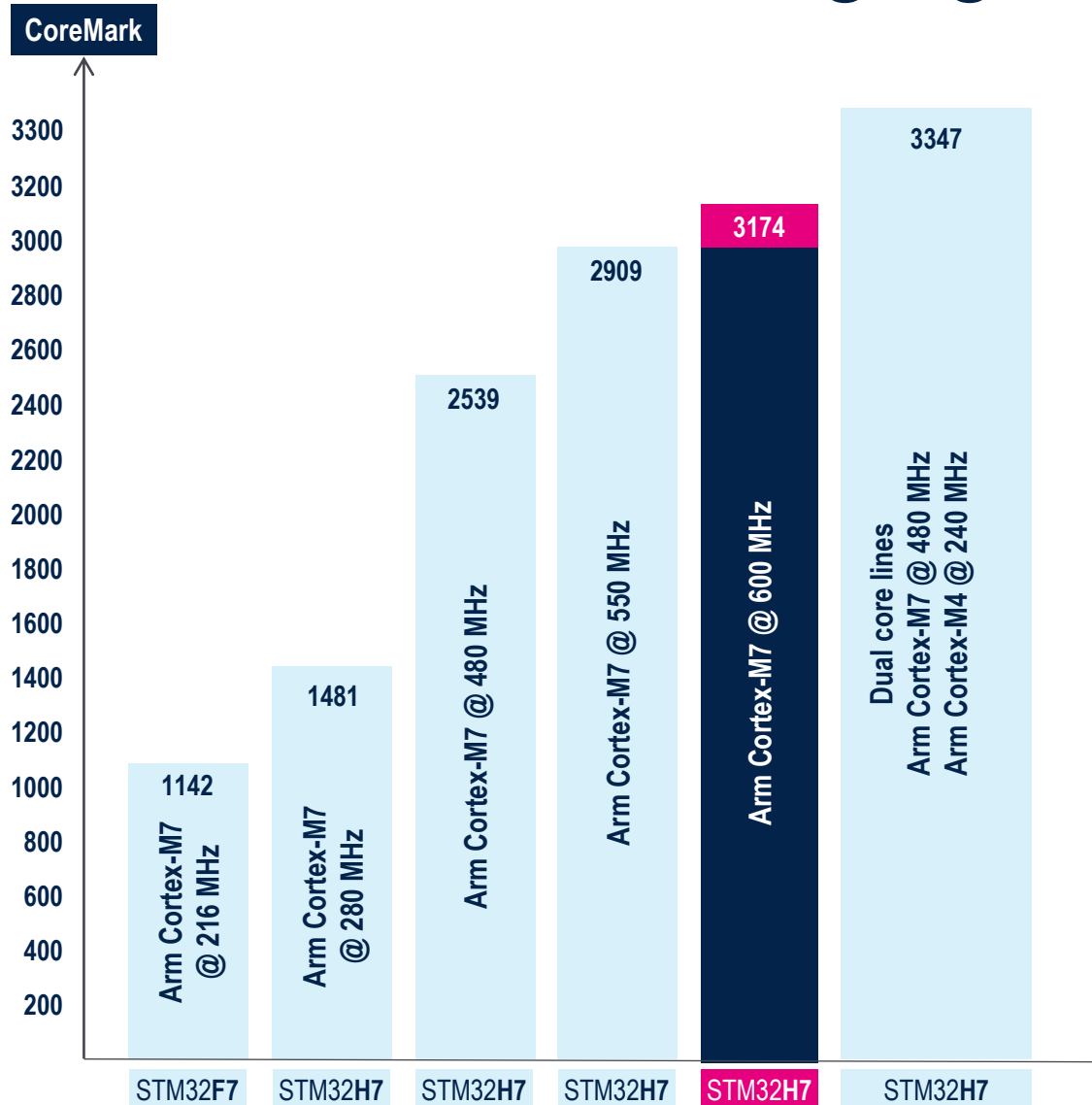




# High-performance & multi-purpose MCUs for a wide range of applications



# A high-performance architecture leveraging internal and external memories



## Arm® Cortex®-M7 @ 600 MHz

- Double precision FPU, MPU, advanced DSP
- 32 Kbytes + 32 Kbytes L1 I/D allowing zero wait-state execution from external memories
- 620 Kbytes of SRAM
- High speed external memory support up to 200 MHz DTR

**1284 DMIPS**

**3174 CoreMark**

# Why choose the STM32H7R/S bootflash MCU?

#1

Lowest cost STM32H7 to-date

#2

Fast memory interfaces up to 200MHz DTR

#3

More freedom to connect any MCU memory type

#4

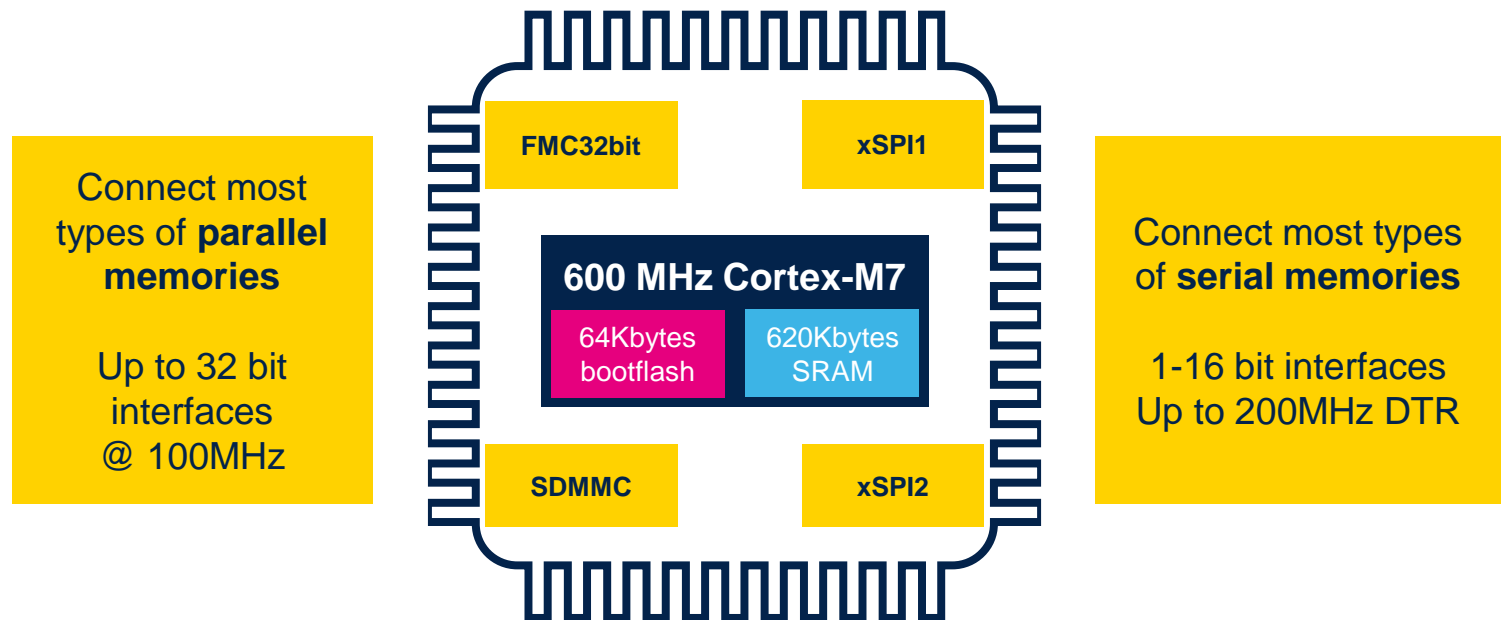
Ecosystem to configure boot & code execution

#5

Load & run code in large internal SRAM for faster execution

The STM32HR/S lines are the **most cost-effective** STM32H7 MCUs.

They offer fast external memory interfaces to provide more **freedom on memory selection and architecture.**





# Bringing new features to the STM32H7 series



200 MHz Hexadeca SPI with PHY and DTR-mode  
**Fewer pins, more performance**



NeoChrom GPU, JPEG Codec and LTDC  
**Accelerating MPU-like GUIs**



Code execution from external/internal memory  
**Securing internal & external code & data**



I3C with DMA & 2xUSB HS/FS with PHY & UCPD  
**Enriched communication interfaces**





# STM32H7RS MCU block diagram

High performance

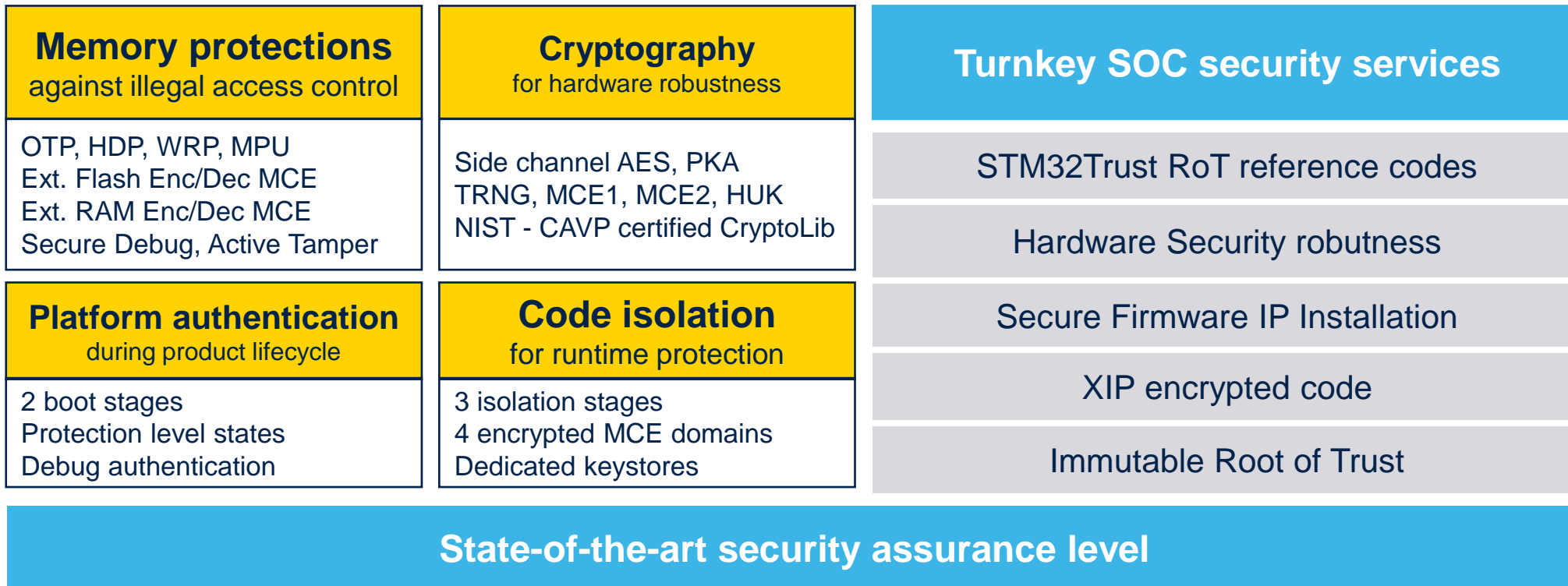
Scalable security

Large embedded RAM memory

Fast & flexible external memory I/F

Advanced graphic capabilities

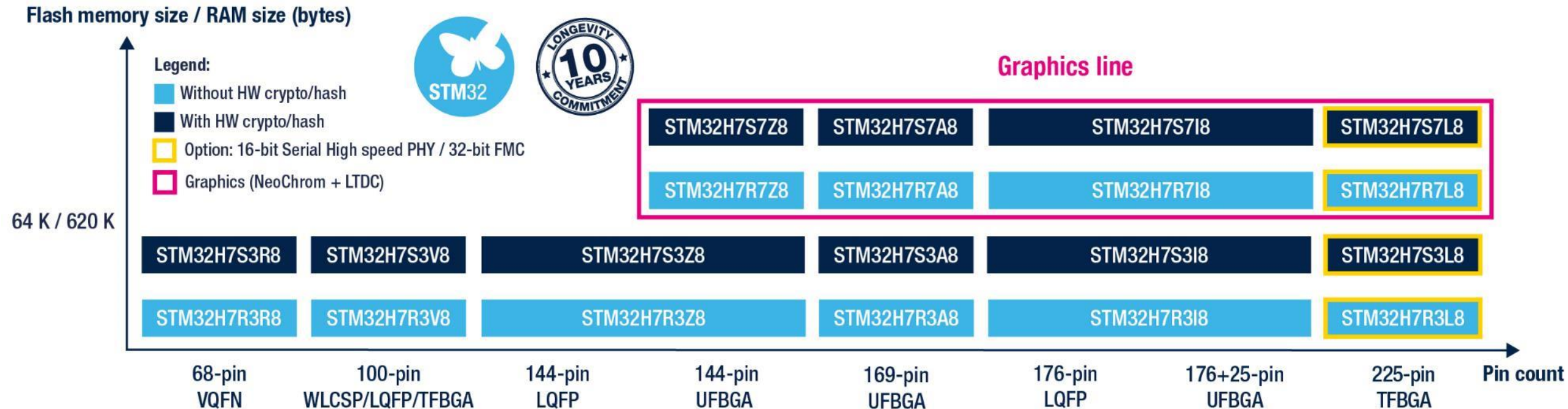
## Robust hardware features and turnkey SoC software implementations





# STM32H7Rx/Sx portfolio

General-purpose & graphics lines, security options, large package offering



# A rich & fast set of memory interfaces

<b>Memory types &amp; standards</b>	<b>Serial RAM</b> Single/Quad/Octo/Hexa Serial PSRAM  <b>Serial Flash</b> Single/Quad/Octo/Hexa NOR & NAND  <i>XSPI (JDES251C), HyperBus, Xcella</i>	<b>Parallel RAM</b> PSRAM, SDRAM, LPDDR SDRAM  <b>Parallel Flash</b> NOR & NAND	<b>MultiMediaCard System v. 5.1</b> <b>SD Memory v. 6.0</b> <b>SDIO v 4.0</b>
<b>Max interface frequency</b>	200MHz <b>DTR</b> (with PHY)	100 MHz SDR	200 MHz
<b>Interface width</b>	Up to 16-bit (Hexadeca) + Up to 8-bit (Octo)	Up to 32-bit	2x 1/2/4/8-bit
<b>Memory interfaces</b>	<b>XSPI</b> Expanded Serial Peripheral Interface w. DMA	<b>FMC</b> Flexible memory controller w. DMA	<b>SDIO</b> Secure digital input/output multimedia interface w. DMA



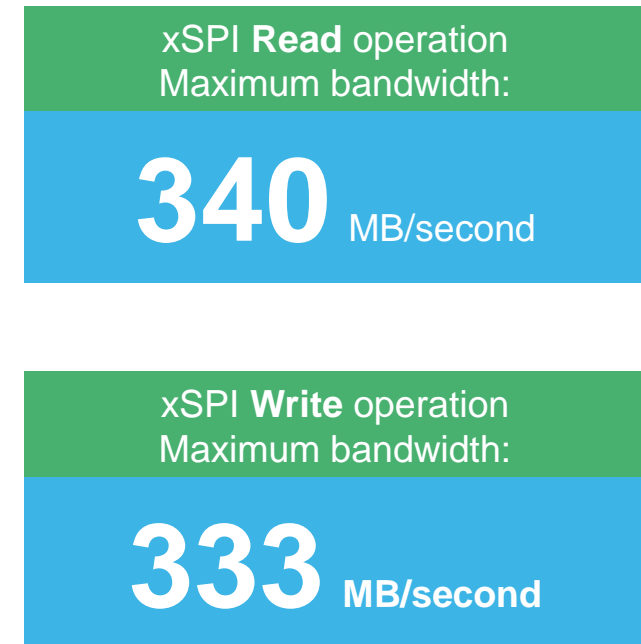
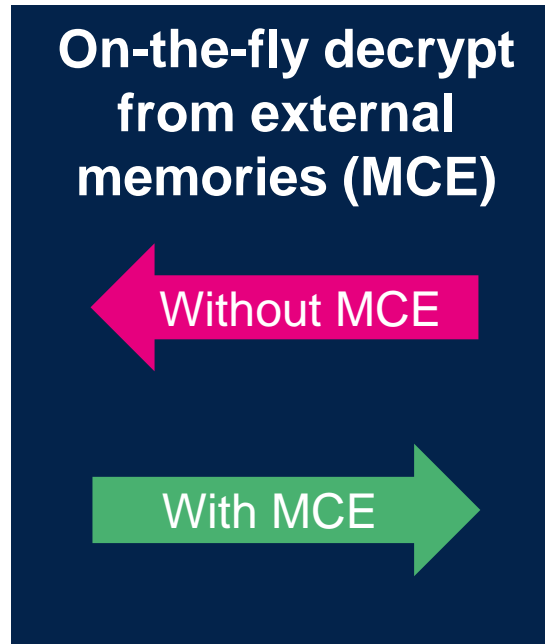
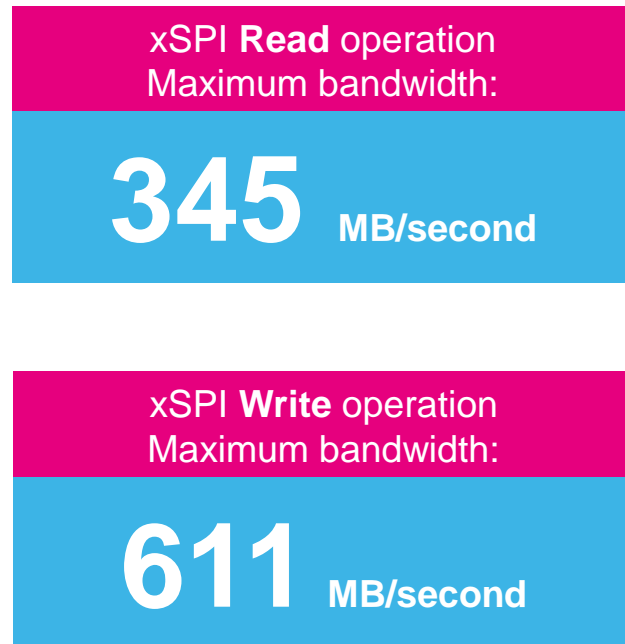
# External serial memory Performance

## OctoSPI NOR Flash



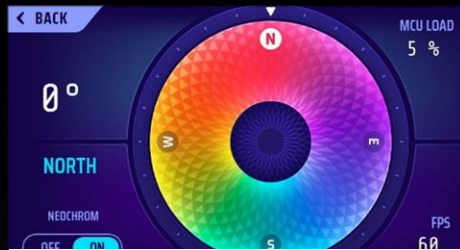
# Memory performance

## xSPI interface: 16bit serial PSRAM

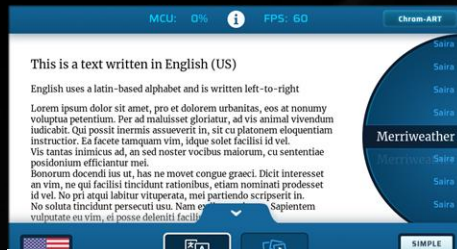


### Test conditions :

- CPU frequency : 600 MHz
- AXI frequency : 300 MHz
- Memory frequency : 200 MHz
- Load 16kB
- Memory in HEXA configuration (16-bit mode)
- Ext mem: 16bit serial PSRAM memory in DQS mode



**360° Bitmap rotations**



**Text scrolling**



**Fast 2D bitmap copy  
Color format conversion**



**MJPEG Videos**



**Scale/animate bitmaps**



**Full screen transitions**



**Vector graphics (SW)**



**Perspective correct  
texture mapping**



# Accelerate GUIs with STM32H7R/S

*Developed with the free-of-charge TouchGFX SW*

 **NeoChrom  
GPU**

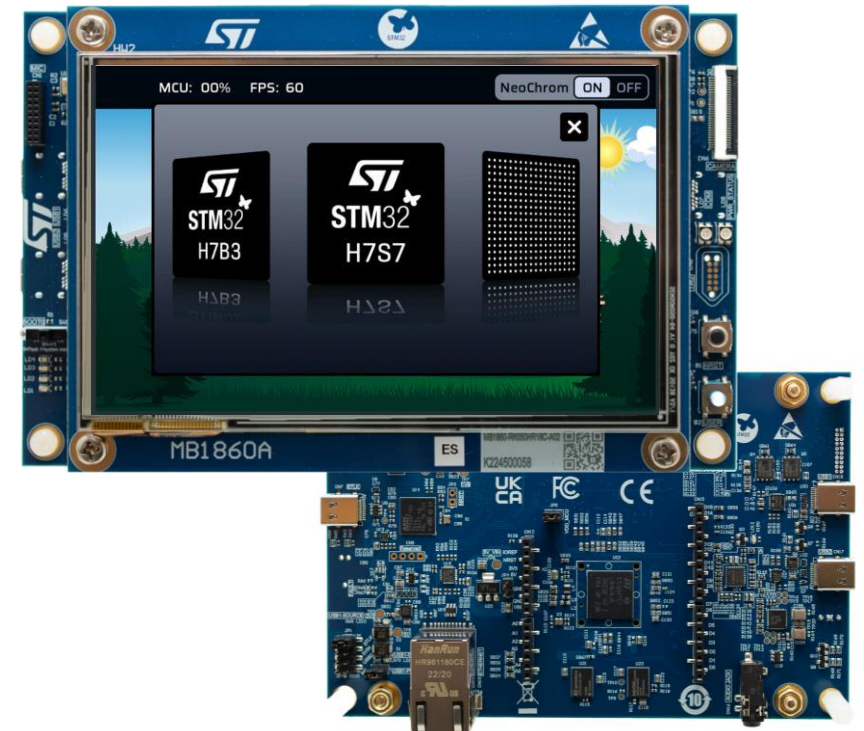
  
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# High-performance graphics on STM32H7R/S

Experience the newest STM32H7 high-performance graphics MCU running up to WSVGA in 16 bpp resolutions.

- RGB-TFT 16/18/24 bit and parallel 8080 display interface
- Fast code execution from external memories (XiP)
  - FMC for **16/32 bit SDRAMs** and **xSPI** for **x8** and **x16 bit** serial Hyper/Octal/PSRAMs
- **NeoChrom GPU** for more graphics accelerations
  - 2.5D, 2D copy, Scaling, rotation, mirroring, alpha-blending and much more
- JPEG CODEC for accelerating **MJPEG videos**





# STM32 NeoChrom GPU

## Texture mapping capabilities

Texture mappers have a significant effect on the MCU load. NeoChrom graphic accelerator improves the performance significantly for operations like texture mapping, image scaling and rotation.



**Graphic operation example:**  
i Coverflow of 3 bitmaps, which are texture mapped with correct perspective scaling and rotation

During day screen	MCU load	FPS
With NeoChrom	10%	60
Without NeoChrom	79-90%	25



**Accelerate your development with our  
dedicated ecosystem**





# STM32Cube framework

## Tools and software supporting you during all your design steps

Evaluation,  
prototyping  
and selection

Hardware and  
software  
configuration

Application development and debug

Code and hardware  
options  
programming

Run-time  
application  
monitoring

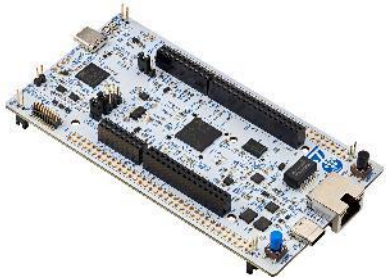


Worldwide support channels



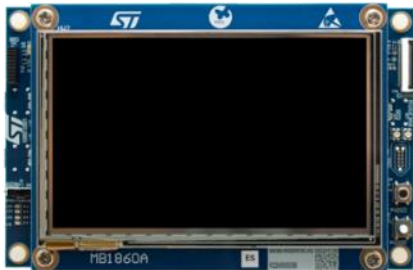
# Development tools for STM32H7R series

Jump-start your development with STM32H7R evaluation kits



\* \$35

**NUCLEO-H7S3L8**



\* \$99

**STM32H7S78-DK**

- **Prototyping with STM32H7S Nucleo board**
  - 256 Mbit Octo-SPI NOR Flash
  - Ethernet, USB,
  - STLINK debugger, Arduino UNO extension interface
- **Feature-rich prototyping with STM32H7S discovery kit**
  - 1 Gbit Octo-SPI NOR Flash, 256Mbit Octo-SPI PSRAM
  - WVGA TFT display, Ethernet, USB, microSD, audio, microphone mems
  - STLINK debugger, Arduino UNO, and camera extension interfaces
- **Move from idea to implementation in no time**
  - STM32CubeMX assisted project start on STM32H7S Nucleo board
  - Full project template with BSP and ready to call services
  - Preconfigured STM32 clocks, pinout, and peripherals



# Simplified external memory-based development

## Application

STM32CubeMX assists the application project initialization with pinout, clock tree, MCU peripherals and middleware configuration.

## External memory loader

STM32CubeMX assists the creation of memory loader tuned for your selected external memory.

## Boot

STM32CubeMX assists the creation of your boot project including access management to your selected external memory with Load-and-Run or Execute-in-place boot options.

# Our technology starts with You

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