

# RENESAS SYNERGY™ PLATFORM

A complete and qualified embedded MCU software and hardware platform





# START AHEAD

Get to market faster and easier with Renesas Synergy.  
As the first fully qualified MCU software and hardware platform,  
we help you reach more people, sooner.



## WHY SYNERGY?

[renesassynergy.com](https://renesassynergy.com)



### Accelerate Development

Let us take care of everything below the API so you can focus on differentiating your product.



### Reduce Total Cost of Ownership

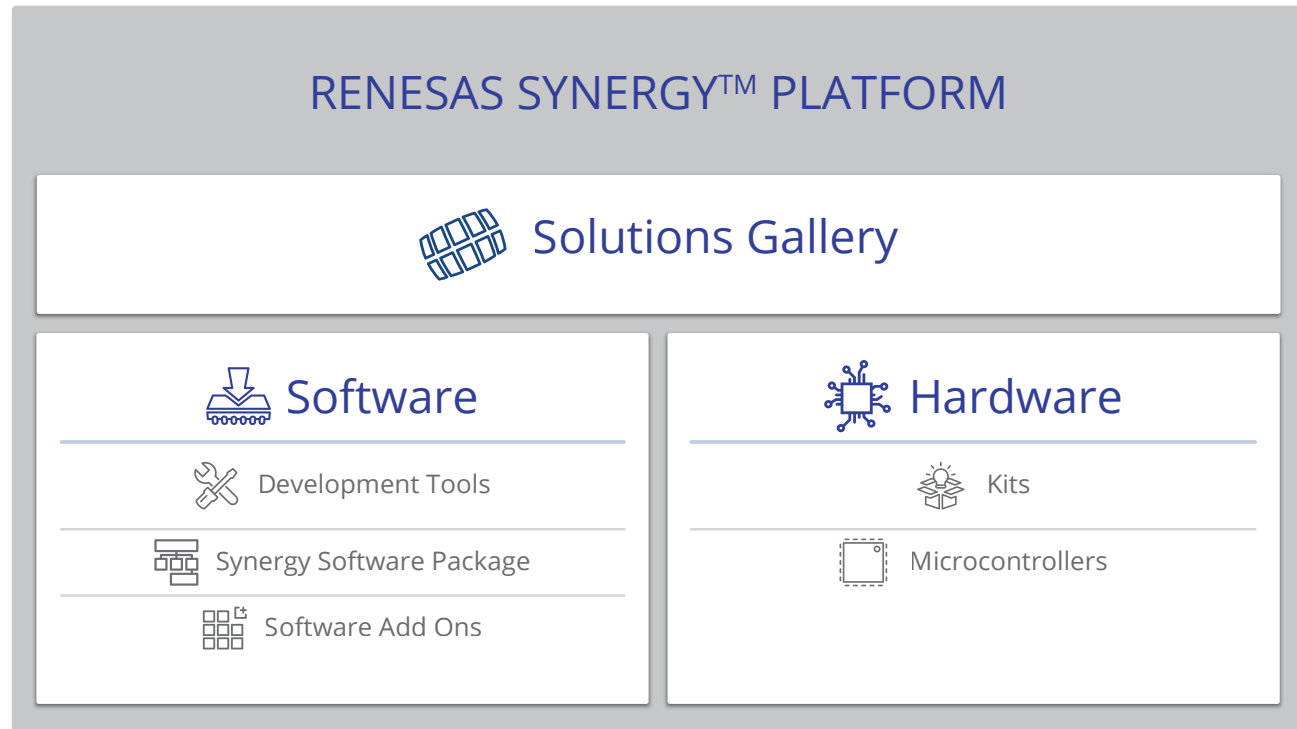
Lower your costs from start to finish – technology, development, and maintenance are all included.



### Eliminate Barriers to Entry

Innovate without facing obstacles of upfront costs, complicated licensing, or starting from square one.

# EXPERIENCE THE POWER OF **THE PLATFORM**



## **PLATFORM**

/ 'plat-fôrm / noun, a software and hardware architecture that serves as a foundation or base.

## **SOFTWARE**

Synergy Software includes the tools to develop your application on top of the Synergy Software Package (SSP), and your requirements for specialized software functions are fulfilled with Software Add-on components.

## **HARDWARE**

Synergy Hardware consists of a wide range of kits for rapid development and prototyping and a scalable and compatible family of Arm® Cortex®-M based MCUs fully accessible through the software APIs.

## **SOLUTIONS**

The Synergy Solutions Gallery is host to all Synergy Platform-compatible software, hardware, kits, tools, and services from partner companies. Synergy Platform components from Renesas are also included for quick selection and access.



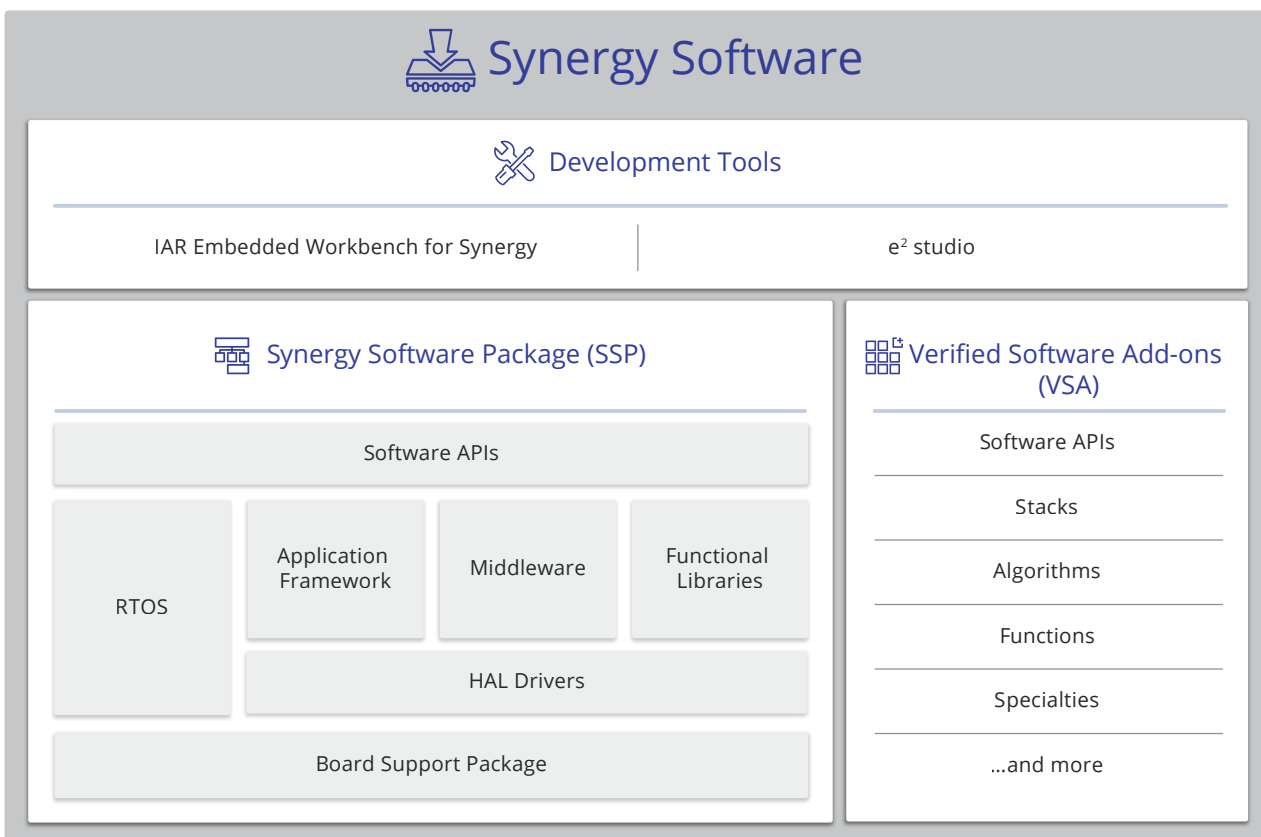


# SYNERGY SOFTWARE

Commercially qualified software developed and optimized for the Synergy Platform

Connected devices, especially for IoT, elevate the requirements for embedded systems software. Real-time operating systems (RTOS), network protocols, security, and power management are just a few examples. Synergy Software delivers solutions in three ways – your choice of professional Development Tools, the Synergy Software

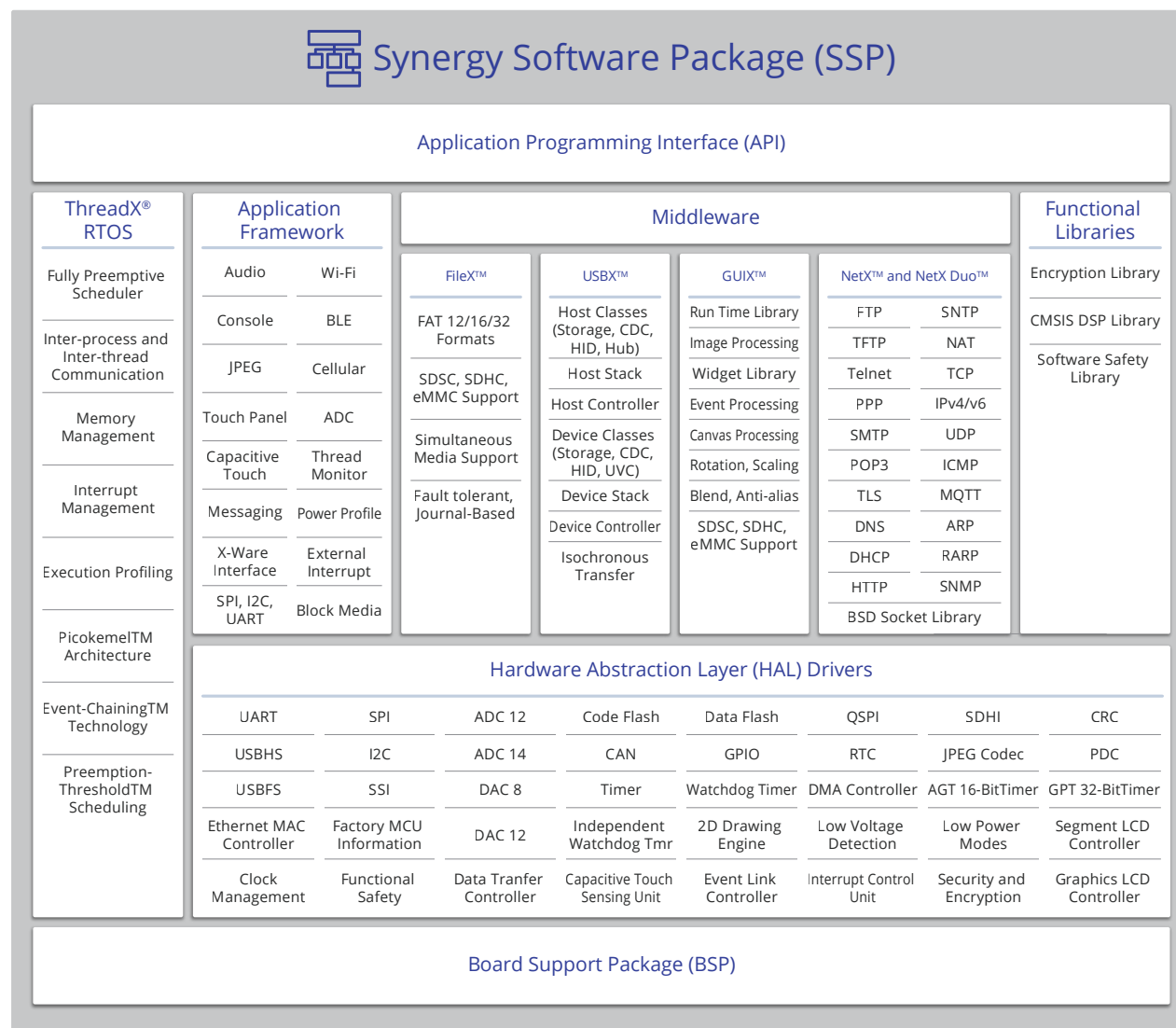
Package (SSP), and Verified Software Add-ons. Full licensing, maintenance, support, and an unlimited number of tool development seats and products that use the SSP are included. No royalties, no fees. Learn more at [renesas.com/synergy](https://renesas.com/synergy)



## Synergy Software Package

SSP is a proven series of frameworks and standard APIs that tightly integrate a premium commercial RTOS, a suite of middleware, a variety of libraries, and low-level drivers to simplify complex functions you encounter while developing connected embedded systems.

A layered architecture enables you to write your application with the Application Frameworks using common APIs or by directly connecting to the MCU device driver level as needed. Renesas qualifies the SSP to operate per SSP datasheet specifications, and Renesas provides all SSP maintenance and support. Learn more at [renesas.com/synergy](https://renesas.com/synergy)



## Software Quality Assurance

To ensure production readiness, Renesas developed the SSP according to the international standard ISO/IEC/IEEE 12207 that covers the entire Software Development Life Cycle. Every element of the SSP is defined

by and tested to meet these requirements. SSP quality is tracked and measured using combinations of unit, functional, integration, performance, regression, dynamic, and static analysis tests.

## Verified Software Add-ons

Verified Software Add-ons (VSAs) extend the functionality of the SSP to enable a range of specialized software functions, including communication protocols, enhanced security functions, control algorithms, cloud connectivity, and cloud services. VSAs are provided by third-party partner companies and verified by Renesas to be SSP-compatible.

Learn more at [renesas.com/addons](https://renesas.com/addons)

## Synergy Software Tools

Designed to accelerate time to market through rapid code development, Synergy Tools facilitate file management, software and MCU configuration, code generation, compilation, debugging, and intuitive graphic interface design.

All Synergy tools, support, development seats, and maintenance are included with the Synergy Platform in the price of a single Synergy MCU.

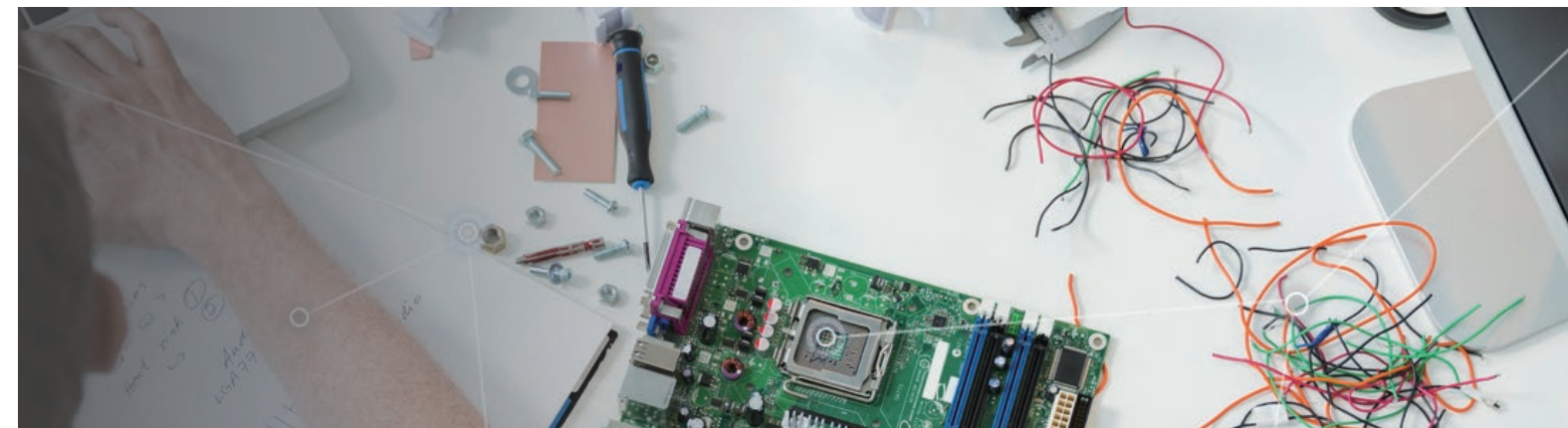
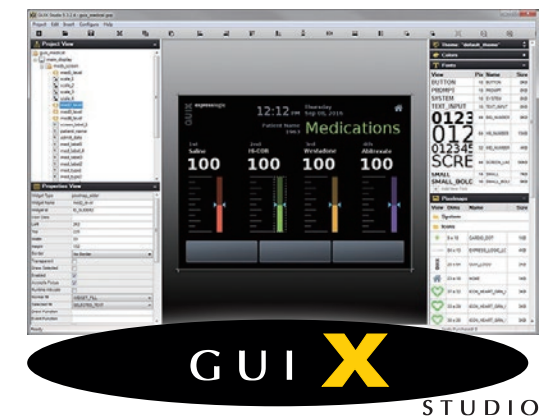
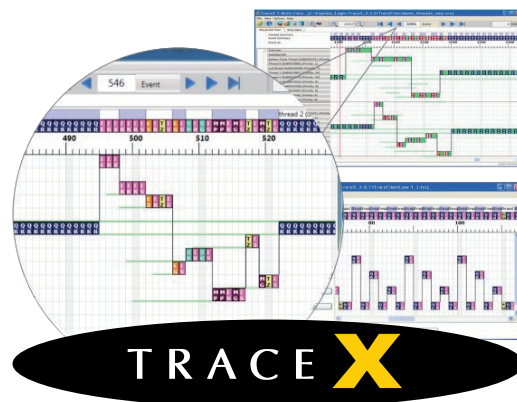
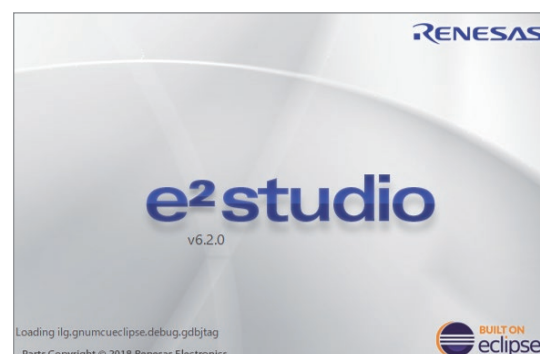
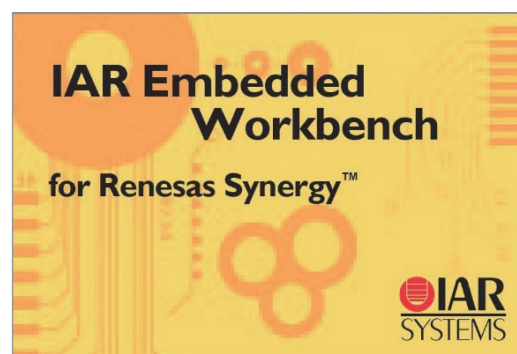
Learn more at [renesas.com/tools](https://renesas.com/tools)

VSA examples available now:

- Industrial protocols CANopen, BACnet
- DALI 2.0 digital lighting protocol
- Powerline Carrier protocol
- Industrial Cloud Services
- Secure Boot
- HTTPS and more

You can use any of these professional tools to develop software for your end-product.

- e<sup>2</sup> studio Integrated Development Environment (IDE) with choice of GCC or IAR C/C++ compilers and automatic code generation
- IAR Embedded Workbench<sup>®</sup> for Renesas Synergy™ IDE to generate fast performing, highly compact code
- TraceX<sup>®</sup> to visually monitor run-time performance
- GUIX Studio™ to enable drag-and-drop design of graphical user interfaces (GUI)



## SYNERGY HARDWARE

Scalable and compatible family of Arm<sup>®</sup> Cortex<sup>®</sup>-M based MCUs operating from 32MHz to 240MHz

Use the Synergy MCU Family to design a wide range of embedded systems and IoT devices, from efficient battery-powered applications to high-performance connected products.

Select a Synergy Kit to evaluate the full Synergy Platform, access functionality of Synergy MCUs, and prototype rapidly to save time and resources. Learn more at [renesas.com/hardware](https://renesas.com/hardware)

### Synergy Hardware

Synergy Microcontrollers	Synergy Kits
<div style="display: flex; justify-content: space-around;"> <div style="background-color: green; color: white; padding: 5px; font-weight: bold;">S1</div> <div style="background-color: blue; color: white; padding: 5px; font-weight: bold;">S3</div> <div style="background-color: red; color: white; padding: 5px; font-weight: bold;">S5</div> <div style="background-color: orange; color: white; padding: 5px; font-weight: bold;">S7</div> </div>	<ul style="list-style-type: none"> <li>PK – Promotion Kit</li> <li>SK – Starter Kit</li> <li>TB – Target Board Kit</li> <li>DK – Development Kit</li> </ul>

## Synergy Kits

Select a Synergy Kit to evaluate the full Synergy Platform, access functionality of Synergy MCUs, and prototype rapidly.

Learn more at [renesas.com/kits](https://renesas.com/kits)



Target Board Kits



Starter Kit



Development Kits



## Synergy Microcontrollers

**120 MHz Arm® Cortex®-M4 CPU**

FPU | ARM MPU | NVIC | ETM | JTAG | SWD | Boundary Scan

<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Memory</b></div> <ul style="list-style-type: none"> <li>Code Flash (up to 2 MB)</li> <li>Data Flash (64 KB)</li> <li>SRAM (640 KB)</li> <li>Flash Cache</li> <li>Memory Protection Unit</li> <li>Memory Mirror Function</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Analog</b></div> <ul style="list-style-type: none"> <li>12-Bit A/D Converter x2 (24 ch.)</li> <li>12-Bit D/A Converter x2</li> <li>High-Speed Analog Comparator x6</li> <li>PGA x6</li> <li>Temperature Sensor</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Timing &amp; Control</b></div> <ul style="list-style-type: none"> <li>General PWM Timer 32-Bit Enhanced High Resolution x4</li> <li>General PWM Timer 32-Bit Enhanced x4</li> <li>General PWM Timer 32-Bit x6</li> <li>Asynchronous General Purpose Timer x2</li> <li>WDT</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>HMI</b></div> <ul style="list-style-type: none"> <li>Capacitive Touch Sensing Unit (18 ch.)</li> <li>Graphics LCD Controller</li> <li>2D Drawing Engine</li> <li>JPEG Codec</li> <li>Parallel Data Capture Unit</li> </ul>
<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Connectivity</b></div> <ul style="list-style-type: none"> <li>Ethernet MAC Controller</li> <li>Ethernet DMA Controller</li> <li>Ethernet PTP Controller</li> <li>USBHS   USBFS</li> <li>CAN x2   SDHI x2</li> <li>Serial Communications Interface x10</li> <li>IrDA Interface</li> <li>QSPI   SPI x2</li> <li>IIC x3   SSI x2</li> <li>Sampling Rate Converter</li> <li>External Memory Bus</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>System &amp; Power Management</b></div> <ul style="list-style-type: none"> <li>DMA Controller (8 ch.)</li> <li>Data Transfer Controller</li> <li>Event Link Controller</li> <li>Low Power Modes</li> <li>Multiple Clocks</li> <li>Port Function Select</li> <li>RTC</li> <li>SysTick</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Safety</b></div> <ul style="list-style-type: none"> <li>ECC in SRAM</li> <li>SRAM Parity Error Check</li> <li>Flash Area Protection</li> <li>ADC Diagnostics</li> <li>Clock Frequency Accuracy Measurement Circuit</li> <li>CRC Calculator</li> <li>Data Operation Circuit</li> <li>Port Output Enable for GPT</li> <li>IWDT</li> </ul>	<div style="border-bottom: 1px solid #ccc; padding: 5px 5px 0 5px;"><b>Security &amp; Encryption</b></div> <ul style="list-style-type: none"> <li>128-Bit Unique ID</li> <li>TRNG</li> <li>AES (128/192/256)</li> <li>3DES/ARC4</li> <li>RSA/DSA</li> <li>SHA1/SHA224/SHA256</li> <li>GHASH</li> </ul>

Example Synergy MCU from the S5D9 Group



Ultra Low Power



High Efficiency



High Integration

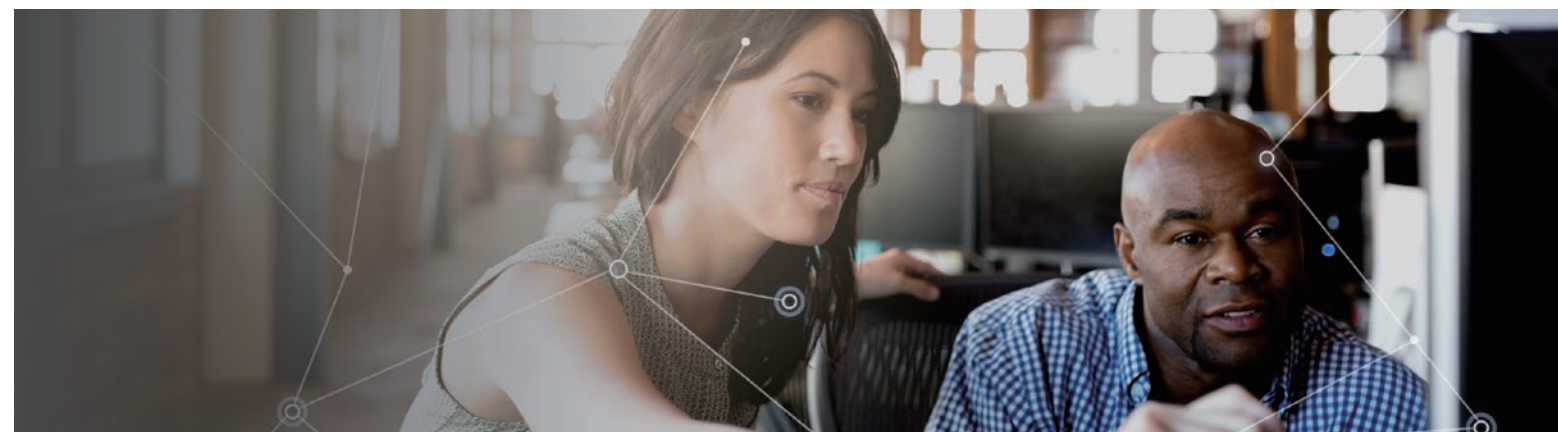


High Performance

### Scalable and Compatible

Synergy MCUs cover a wide range of Arm Cortex-M based microcontrollers, fully accessible through the software APIs, operating from 32MHz to 240MHz with flash memory sizes from 64KB to 4MB.

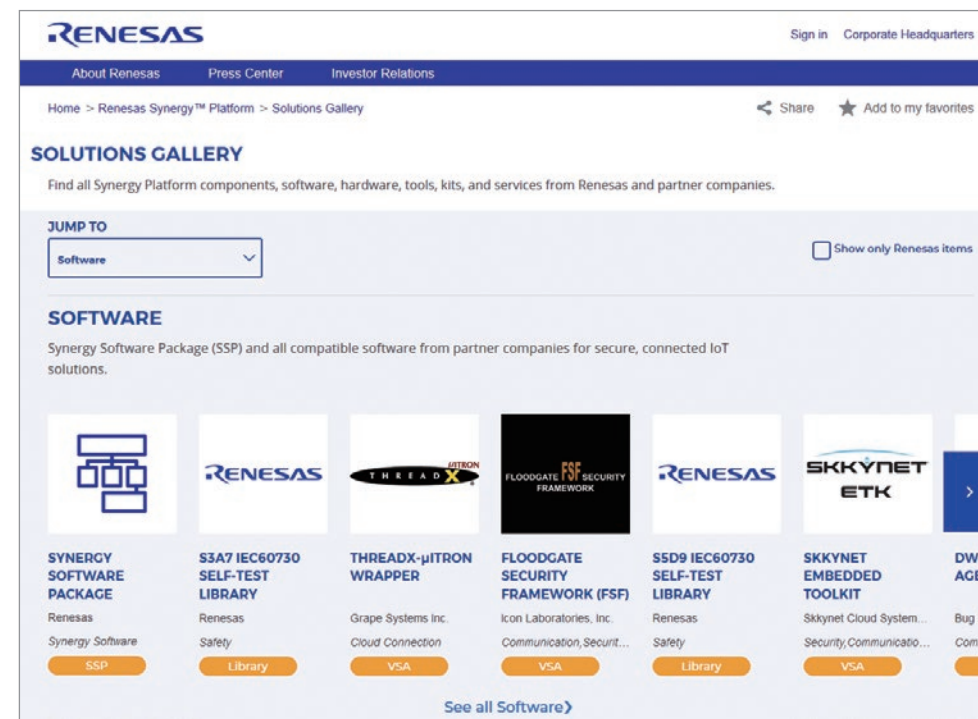
Select from four different Synergy MCU Series with scalable features for connectivity, security, safety, analog, and human-machine interface (HMI) to enable a high degree of code reuse. Learn more at [renesas.com/synergy/mcus](https://renesas.com/synergy/mcus)



## SYNERGY SOLUTIONS GALLERY

Easily find all Synergy Platform-compatible components, software, hardware, tools, kits, and services

Browse and select knowing that what you are seeing has been validated for compatibility with the Synergy Platform. Choose items and services from partner companies and from Renesas. Learn more at [renesas.com/solutionsgallery](https://renesas.com/synergy/solutionsgallery)



#### Solutions Gallery sections

- Software
- Software Tools
- Hardware Components
- Kits
- Partner Projects
- Hardware Tools
- Production Tools
- Application Projects
- Security
- Cloud Connectivity
- Human Machine Interface
- Design & Testing Services

## SYNERGY WEBSITE

Explore the entire Synergy Platform at [renesas.com/synergy](https://renesas.com/synergy)

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