RENESAS SYNERGY™ PLATFORM

A complete and qualified embedded MCU software and hardware platform

05.2018

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

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

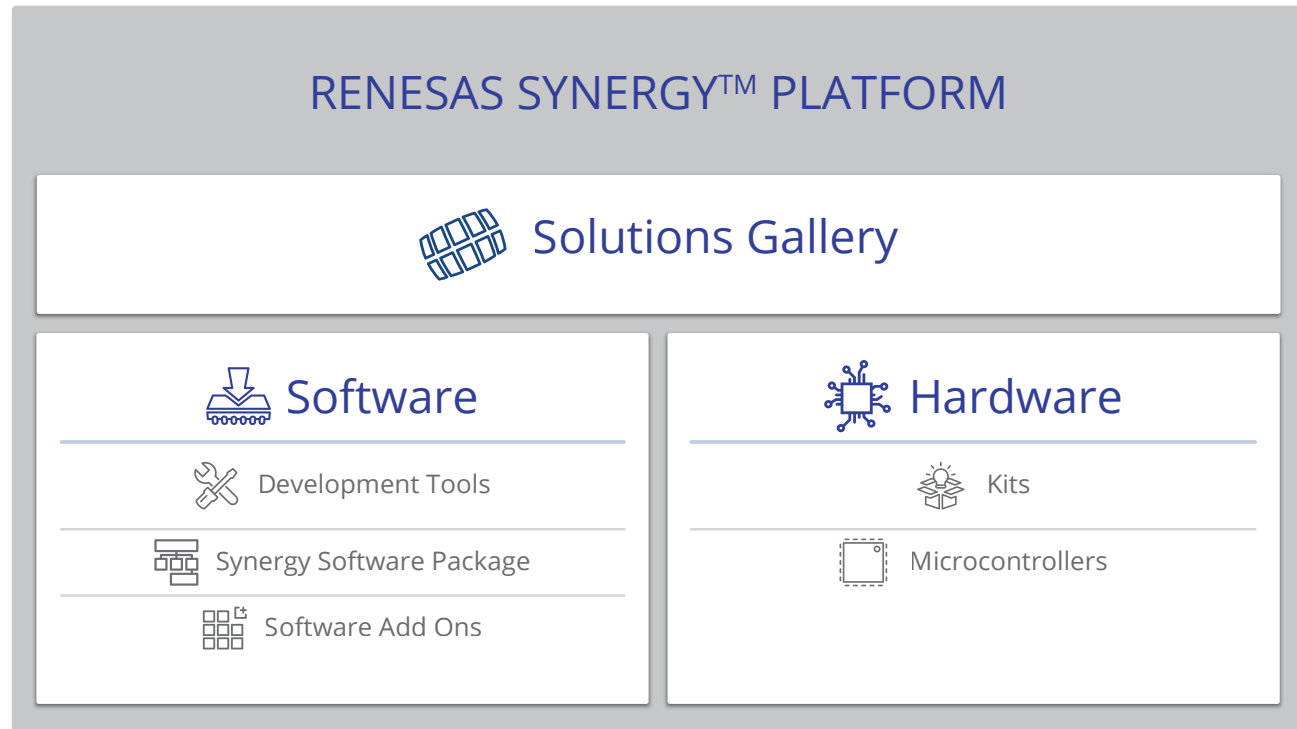### Reduce Total Cost of Ownership
Lower your costs from start to finish – technology,
development, and maintenance are all included.

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

EXPERIENCE THE POWER OF
THE PLATFORM

RENESAS SYNERGY™ PLATFORM

Solutions Gallery

Software
- Development Tools
- Synergy Software Package
- Software Add Ons

Hardware
- Kits
- Microcontrollers

PLATFORM

/ ˈplat-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.
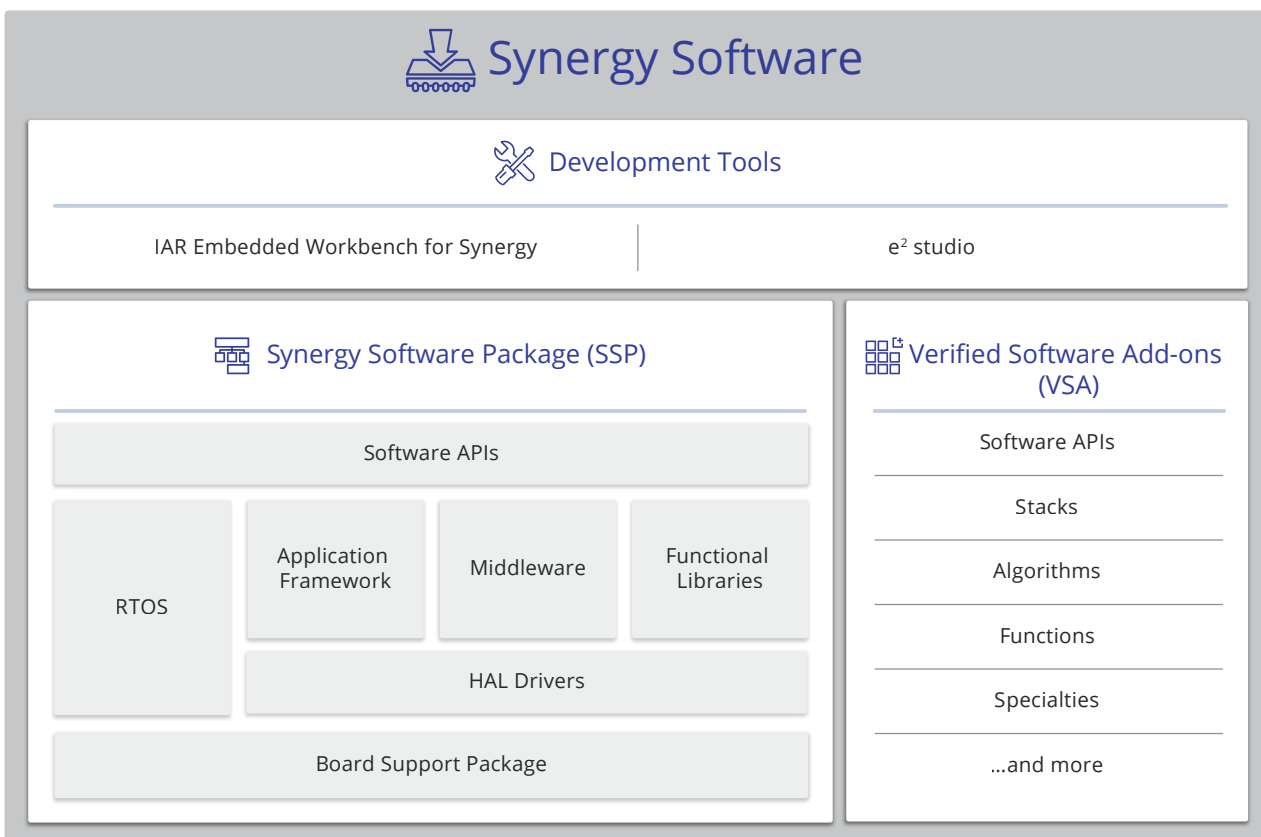
SYNERGY SOFTWARE

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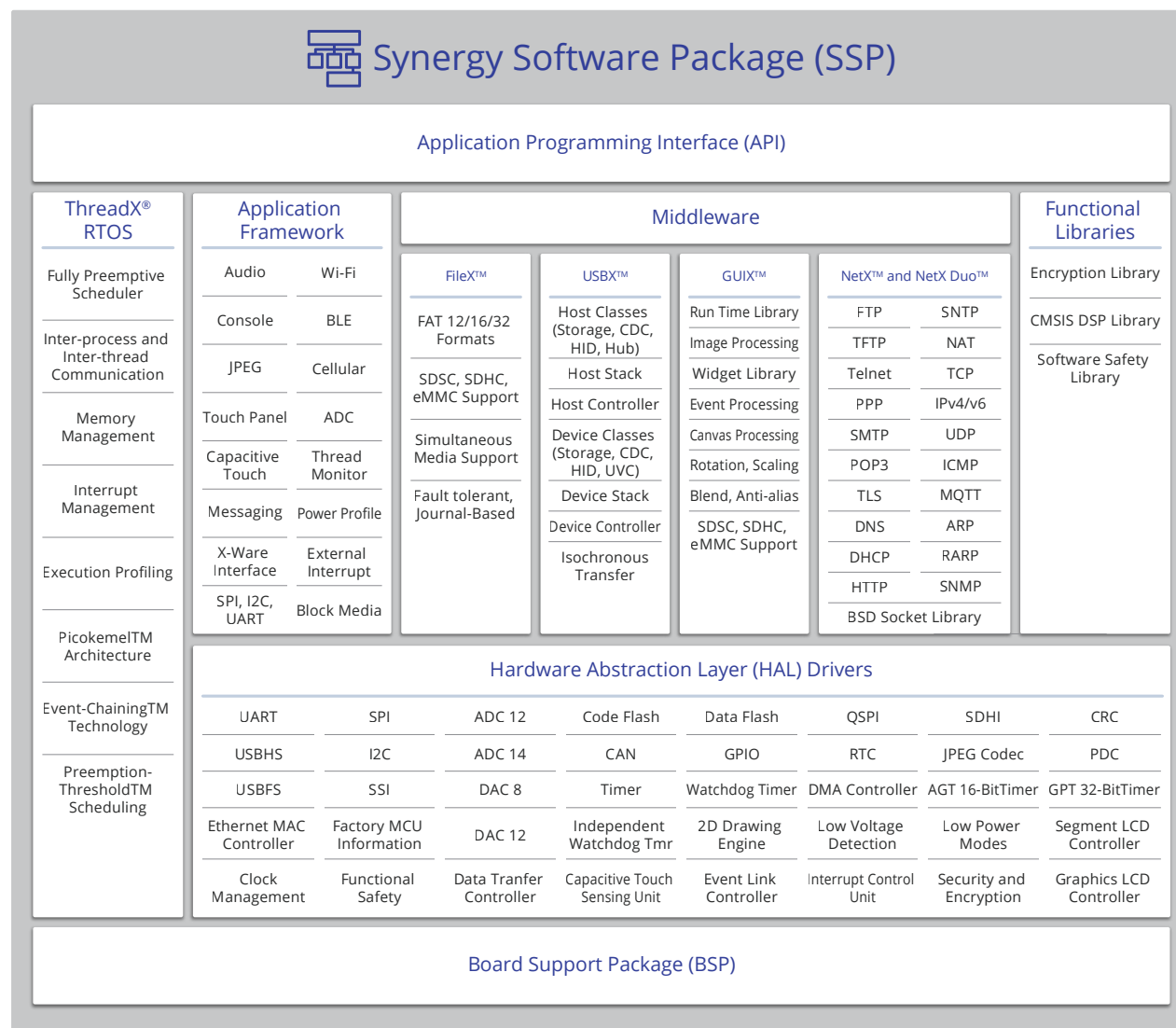
Package (SSP), and Verified Software Add-ons. Full licensing, maintenance, support, and an unlimited number of tool development seats and products that use the SSP are included. No royalties, no fees. Learn more at **renesassynergy.com/software**

Synergy Software

Development Tools

| IAR Embedded Workbench for Synergy | e² studio |

Synergy Software Package (SSP)

Software APIs

| RTOS | Application Framework | Middleware | Functional Libraries |

HAL Drivers

Board Support Package

Verified Software Add-ons (VSA)

Software APIs

Stacks

Algorithms

Functions

Specialties

...and more

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 **renesassynergy.com/ssp**

Synergy Software Package (SSP)

Application Programming Interface (API)

ThreadX® RTOS	Application Framework	Middleware				Functional Libraries

ThreadX® RTOS
Fully Preemptive Scheduler
Inter-process and Inter-thread Communication
Memory Management
Interrupt Management
Execution Profiling
PicokernelTM Architecture
Event-ChainingTM Technology
Preemption-ThresholdTM Scheduling

Application Framework

Audio	Wi-Fi
Console	BLE
JPEG	Cellular
Touch Panel	ADC
Capacitive Touch	Thread Monitor
Messaging	Power Profile
X-Ware Interface	External Interrupt
SPI, I2C, UART	Block Media

Middleware

FileX™	USBX™	GUIX™	NetX™ and NetX Duo™
FAT 12/16/32 Formats	Host Classes (Storage, CDC, HID, Hub)	Run Time Library	FTP / SNTP
SDSC, SDHC, eMMC Support	Host Stack	Image Processing	TFTP / NAT
Simultaneous Media Support	Host Controller	Widget Library	Telnet / TCP
Fault tolerant, Journal-Based	Device Classes (Storage, CDC, HID, UVC)	Event Processing	PPP / IPv4/v6
	Device Stack	Canvas Processing	SMTP / UDP
	Device Controller	Rotation, Scaling	POP3 / ICMP
	Isochronous Transfer	Blend, Anti-alias	TLS / MQTT
		SDSC, SDHC, eMMC Support	DNS / ARP
			DHCP / RARP
			HTTP / SNMP
			BSD Socket Library

Functional Libraries
Encryption Library
CMSIS DSP Library
Software Safety Library

Hardware Abstraction Layer (HAL) Drivers

UART	SPI	ADC 12	Code Flash	Data Flash	QSPI	SDHI	CRC
USBHS	I2C	ADC 14	CAN	GPIO	RTC	JPEG Codec	PDC
USBFS	SSI	DAC 8	Timer	Watchdog Timer	DMA Controller	AGT 16-BitTimer	GPT 32-BitTimer
Ethernet MAC Controller	Factory MCU Information	DAC 12	Independent Watchdog Tmr	2D Drawing Engine	Low Voltage Detection	Low Power Modes	Segment LCD Controller
Clock Management	Functional Safety	Data Tranfer Controller	Capacitive Touch Sensing Unit	Event Link Controller	Interrupt Control Unit	Security and Encryption	Graphics LCD Controller

Board Support Package (BSP)

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 **renesassynergy.com/addons**

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

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 **renesassynergy.com/tools**

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

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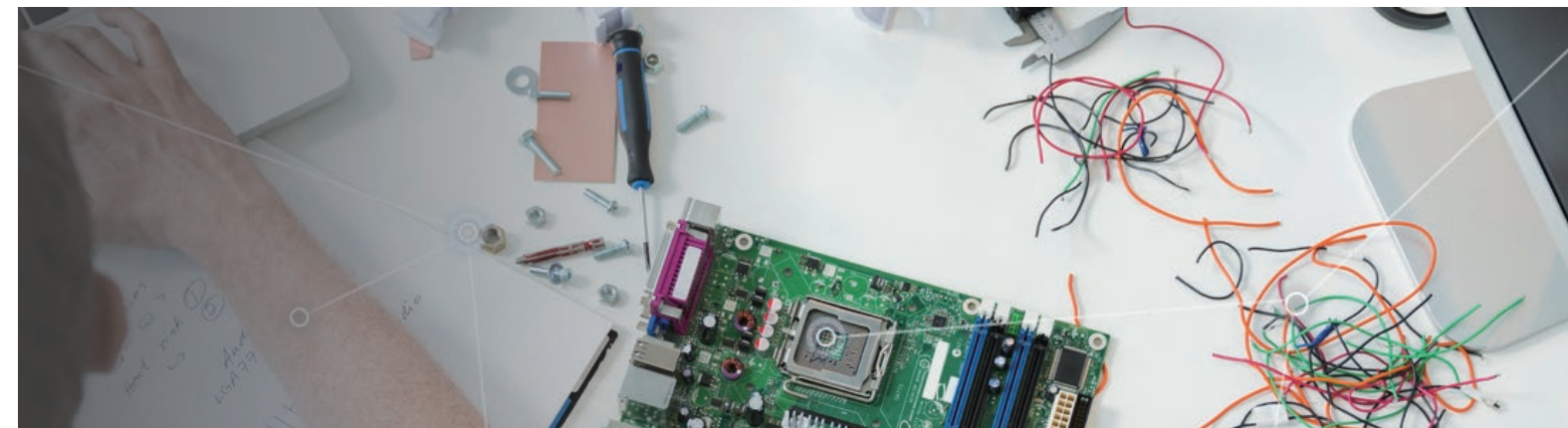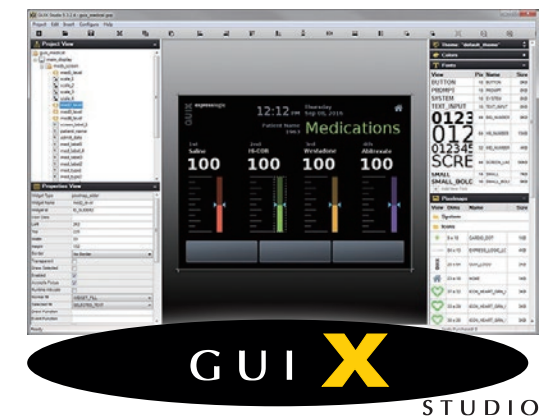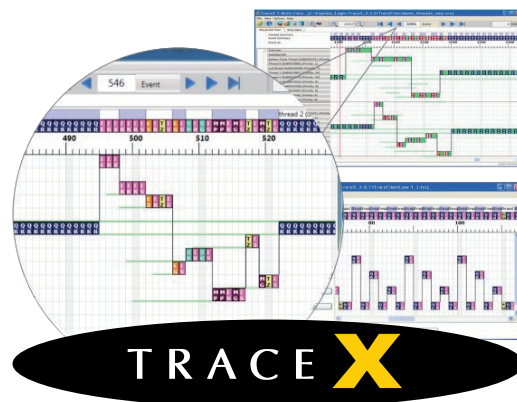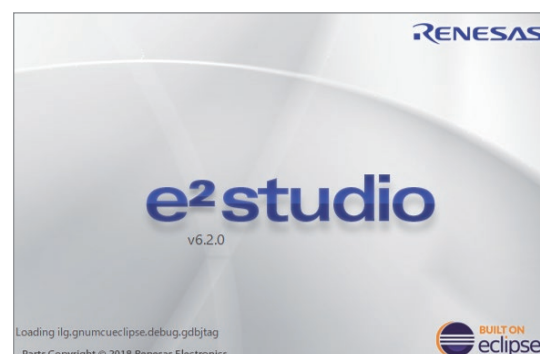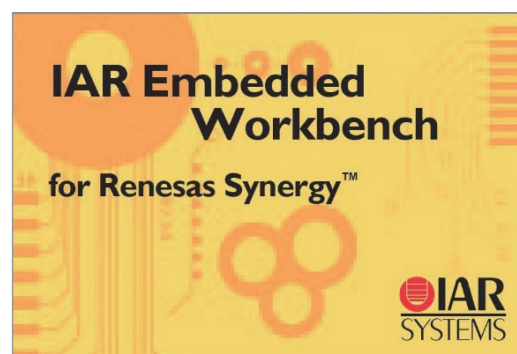
SYNERGY HARDWARE

Scalable and compatible family of Arm® Cortex®-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 **renesassynergy.com/hardware**

Synergy Hardware

Synergy Microcontrollers	Synergy Kits
S1 S3 S5 S7	PK – Promotion Kit
	SK – Starter Kit
	TB – Target Board Kit
	DK – Development Kit

Synergy Kits

Select a Synergy Kit to evaluate the full Synergy Platform, access functionality of Synergy MCUs, and prototype rapidly.
Learn more at **renesassynergy.com/kits**

Target Board Kits　　　　Starter Kit　　　　Development Kits

Synergy Microcontrollers

S5D9 **120 MHz Arm® Cortex®-M4 CPU**   FPU | ARM MPU | NVIC | ETM | JTAG | SWD | Boundary Scan

Memory
Code Flash (up to 2 MB)

Data Flash (64 KB)

SRAM (640 KB)

Flash Cache

Memory Protection Unit

Memory Mirror Function

Analog
12-Bit A/D Converter x2 (24 ch.)

12-Bit D/A Converter x2

High-Speed Analog Comparator x6

PGA x6

Temperature Sensor

Timing & Control
General PWM Timer 32-Bit Enhanced High Resolution x4

General PWM Timer 32-Bit Enhanced x4

General PWM Timer 32-Bit x6

Asynchronous General Purpose Timer x2

WDT

HMI
Capacitive Touch Sensing Unit (18 ch.)

Graphics LCD Controller

2D Drawing Engine

JPEG Codec

Parallel Data Capture Unit

Connectivity
Ethernet MAC Controller

Ethernet DMA Controller

Ethernet PTP Controller

USBHS | USBFS

CAN x2 | SDHI x2

Serial Communications Interface x10

IrDA Interface

QSPI | SPI x2

IIC x3 | SSI x2

Sampling Rate Converter

External Memory Bus

System & Power Management
DMA Controller (8 ch.)

Data Transfer Controller

Event Link Controller

Low Power Modes

Multiple Clocks

Port Function Select

RTC

SysTick

Safety
ECC in SRAM

SRAM Parity Error Check

Flash Area Protection

ADC Diagnostics

Clock Frequency Accuracy Measurement Circuit

CRC Calculator

Data Operation Circuit

Port Output Enable for GPT

IWDT

Security & Encryption
128-Bit Unique ID

TRNG

AES (128/192/256)

3DES/ARC4

RSA/DSA

SHA1/SHA224/SHA256

GHASH

Example Synergy MCU from the S5D9 Group

S1 Ultra Low Power   **S3** High Efficiency   **S5** High Integration   **S7** 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 **renesassynergy.com/mcus**
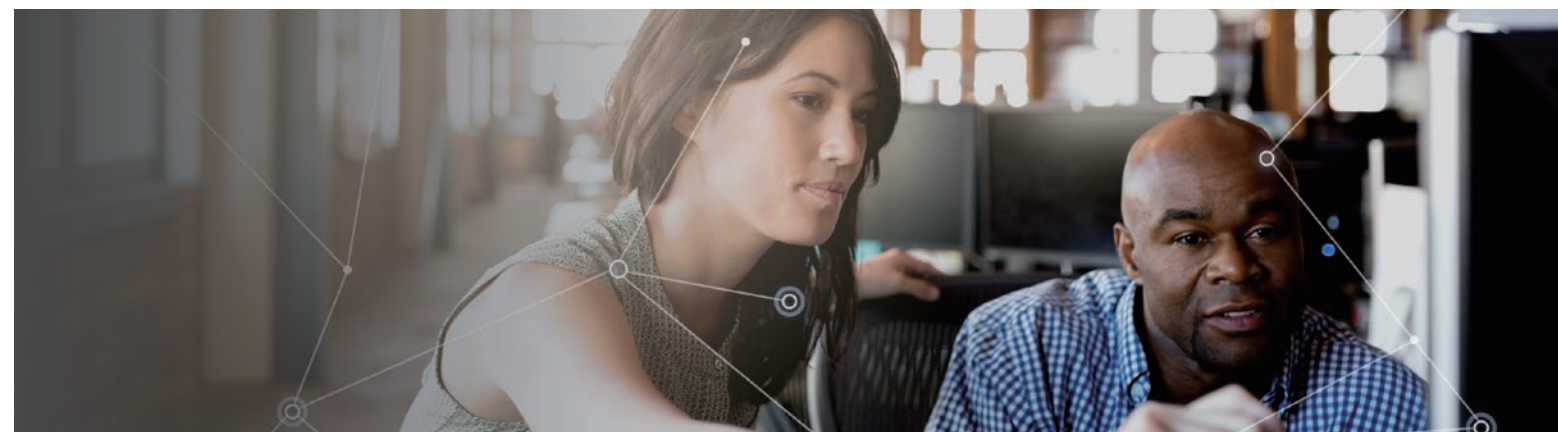
SYNERGY SOLUTIONS GALLERY

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 **renesassynergy.com/solutionsgallery**
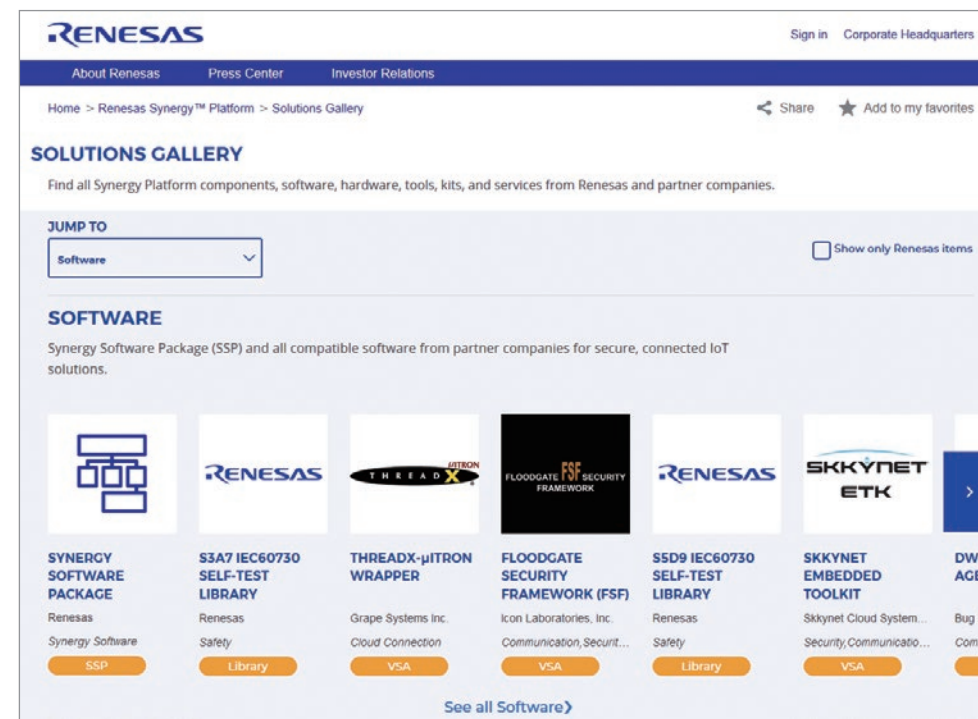
Solutions Gallery sections
- Software
- Software Tools
- Hardware Components
- Kits
- Partner Projects
- Hardware Tools
- Production Tools
- Application Projects
- Security
- Cloud Connectivity
- Human Machine Interface
- Design & Testing Services

SYNERGY WEBSITE

Explore the entire Synergy Platform at **renesassynergy.com**

SALES OFFICES

Refer to **renesas.com** for the latest and detailed information.

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