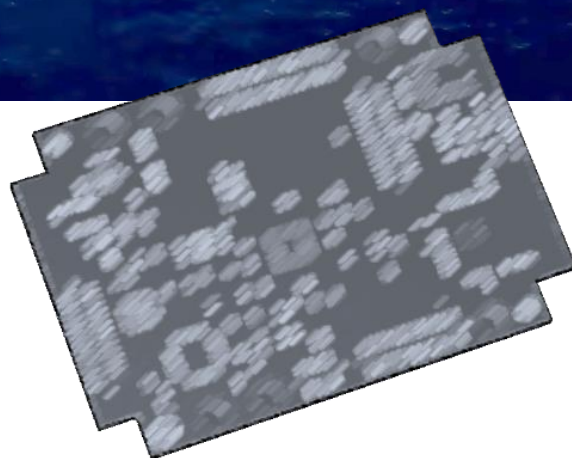


SCM307

Serious Control/I/O Module



Overview

The SCM307 is a small single board off-the-shelf industrial-strength module with processor, memory, I/O, and basic communications all built-in.

Industrial, commercial, and medical products can use the SCM307 as a complete I/O controller, replacing many current custom control and I/O boards. The module includes numerous load drivers and sensor inputs and can connect to in-chassis or external RS422/485 networks.

Powered by a Renesas Synergy® S3A3 MCU with an ARM Cortex-M4 core, the SCM307 comes equipped with two commercially licensed software frameworks: the Serious SHIPWare framework (including SEGGER embOS and stacks) as well as the Renesas Synergy Software Package (SSP).

Applications

- Weigh Scales
- Inventory Control Systems
- Ovens, Warmers, and Coolers
- Water Control
- Production Line Equipment
- Food Service Equipment
- Environmental Controllers

Key Features

Cost Effective, Powerful Processor & Memory

- Renesas Synergy® S3A3 MCU with ARM Cortex-M4 core, 512kB FLASH and 96kB RAM
- 16MB Serial NOR Flash for built-in SHIPv5 Boot System code and user application storage

Industrial Grade Instrumented I/O & Connectivity

- 6x 150mA low-side load drivers for relays, etc.
- 6x 10kΩ thermistor inputs
- 2x 2A solenoid outputs (muxed w/stepper output)
- 1x stepper motor H-bridge output
- 1x mechanical or optical switch input
- 1x load cell input with 24-bit SAR ADC
- RS485/RS422 2/4-wire half/full duplex
- USB host or device option

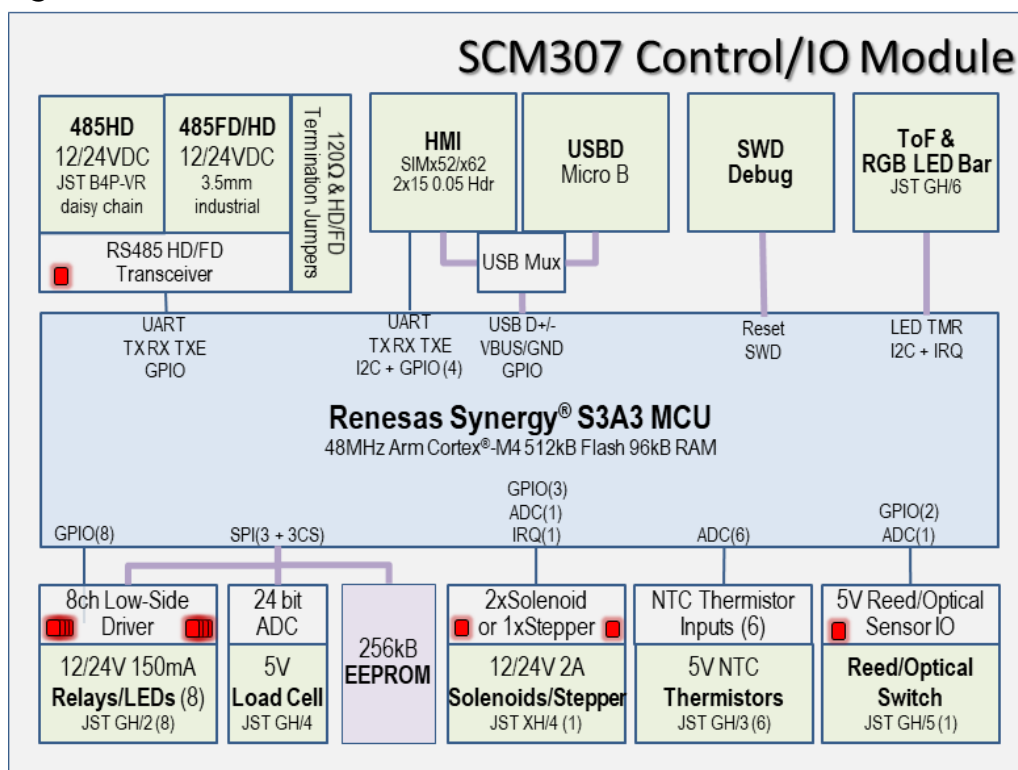
Standalone or Direct Docked Operation

- 30-pin B2B Header for direct-dock option to custom or Serious Gen5 SIMx52 and SIMx62 HMI modules
- Standalone operation with RS422/485 connection

Quick Specifications

- 12VDC or 24VDC supply
- -40 to +85C operation
- TBD x TBD x TBD mm

Block Diagram



Development Kit

The SCM307 Development Kit (order code SCM307-A00-SJL-01), includes the following:

- SCM307-A00 full featured module
- Segger J-Link Lite Cortex M-5V debugger
- 110/220VAC wall adapter for lab use, with barrel jack adapter and sample industrial networking plug
- USB A to Micro B cable
- Example Relay, Solenoid, and Load Cell
- Stripped-one-end IO cables for easy prototyping to your IO devices

In addition, each development kit purchase includes one seat of fully licensed and unlocked Segger Embedded Studio development tools, an \$1,848.00 value.

The SCM307 included in the development kit is identical to the production SCM307-A00, and includes a full object library license for the unit for the Serious + Segger Firmware Platform.

Related Products

For a complete list of available communications/control modules (SCMs) and Serious Integrated HMI Modules (SIMs), see www.seriousintegrated.com/SCMs and www.seriousintegrated.com/SIMs respectively.

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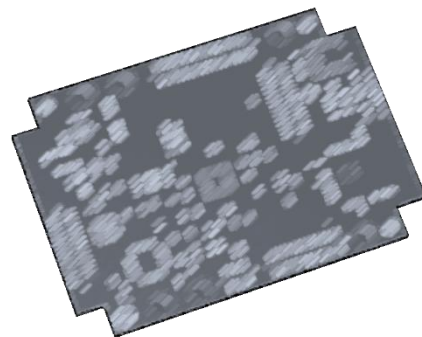
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INTRODUCTION

The SCM307 family of *Serious Control/IO Modules (SCMs)* is a series of off-the-shelf, highly configurable and intelligent industrial electronics modules.

These modules are designed for use by Original Equipment Manufacturers (OEMs) to add an off-the-shelf control system to a variety of industrial, commercial, or medical equipment.

The SCM307 family is powered by the Renesas Synergy® S3A3 MCU: a low-cost, high performance Cortex M4 32-bit MCU with 512kB FLASH and 96kB RAM on board for program and data storage respectively. Peripherals include USB, I2C, SPI, UARTs, Timers, PWMs, 14-bit ADCs, and more.



This MCU is supported by the full SHIPWare software load, including complete, pre-licensed, Segger embOS, emFile, emUSB, and emTCP/IP stacks. This complete set of enabling software and firmware enables OEMs to develop in C using the Segger Embedded Studio for ARM tools, deploying powerful custom communications bridges, applications, and even machine control algorithms.

The MCU is also, at the user's option, supported by the full Renesas Synergy Software Platform (SSP). Similar to SHIPWare, the SSP includes commercially licensed OS, stacks, and frameworks. SSP-based development is supported directly by Renesas.

Various product/feature options (aka "variants") of the family are available to reduce cost based on the feature-set needed in a given application.

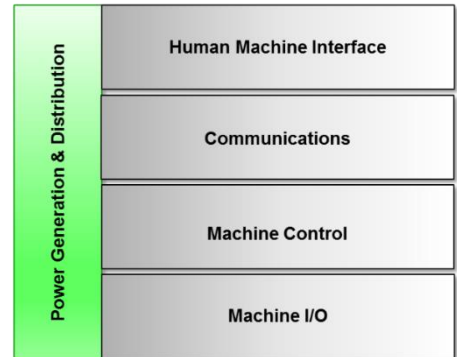
The SCM307 can be used stand alone as the control/IO single hardware platform in an industrial, medical, or commercial product. It can also either connect via RS422/485 to, or directly dock (board-to-board) with, 5th generation HMI modules from *Serious*, including the SIMx52 families (e.g. SIM152, SIM252, SIM352, SIM552) and the SIMx62 families (e.g. SIM362, SIM562, SIM862).

There are numerous other Serious HMI and Communications modules available: for a complete list see www.seriousintegrated.com/SCMs and www.seriousintegrated.com/SIMs respectively.

APPLICATIONS AND USAGE MODELS

Most OEM systems architectures can be represented as a functional stack with four layered ingredients:

- The Human Machine Interface, traditionally lights and buttons, and now moving to intelligent graphic/touch LCD panels,
- A communications hub handling all communications between the HMI and machine as well as externally to the cloud and industrial/enterprise networks,
- Intelligent machine control, including sequencing and safety algorithms for monitoring and controlling the low-level machine I/O, and,
- Low-level machine I/O, including actuators, sensors, and controls that affect the physical operation of the system.



Alongside these four ingredients is the power generation and distribution system, often 12, 18, or 24VDC supplied initially by 110/220VAC wall power.

Serious Integrated Modules (SIMs) are off-the-shelf complete solutions to the HMI front panel, including no-cost rapid GUI development tools and software by *Serious* — the Serious Human Interface™ Platform (SHIP). SHIP is not a traditional low-level C-based programming environment, but rather a high level rapid user experience (UX) development system that abstracts the designer from the complexity of developing modern UX solutions. There is no faster and more effective way to develop, deploy, maintain, and evolve a scalable front panel HMI solution than with SIMs and SHIP enabling technologies.

Serious Communications Modules (SCMs) are off-the-shelf hardware solutions to different aspects of the communications, control, and machine IO layers of this stack. The software on SCMs is designed to be highly tuned to the OEM's specific system, and traditional C-based development supported by *Serious* reference software and third-party partner software infrastructure, such as complete software stacks from Segger, make software development for SCMs far easier than ground-up custom OEM designs.

Serious Unified Modules (SUMs) combine the ingredients of a SIM and SCM into a single cost-optimized solution. While retaining the flexibility and power of the independent programming environments, sharing various electronic elements, such as power supplies, provides cost savings albeit without the mix-and-match flexibility of independently selected and paired SIMs and SCMs.

SOFTWARE OVERVIEW

A COMPLETE NO-COST COMMERCIAL EMBEDDED SOFTWARE ENVIRONMENT

You can waste months porting an OS and developing the board support package, drivers, basic support utilities and communication protocol stacks — even before writing the first line of real application code. Using “free” software stacks can lead you down of path with minimal support and a hodgepodge of building blocks constant requiring attention.

Serious gives you a complete, no-cost, commercially supported development environment, including tools and software, to enable you to focus on your communications and control software, not the infrastructure. We call it Leveraged Embedded.

COMMERCIAL GRADE DEV TOOLS

Every ARM-based SCM Development Kit comes with an unlocked, single seat commercial license to Segger Embedded Studio, enabling powerful cross-platform C development and debugging for your SCM projects. All *Serious* example projects come pre-engineered out-of-the-box for Segger Embedded Studio.

SERIOUS + SEGGER FIRMWARE PLATFORM

Every SCM also comes with *Serious* “SHIPWare” – a full commercially supported set of code and firmware on which you can build powerful control and communications applications, leveraging all the features of your module. SHIPWare includes:

- Segger OS and Stacks
- *Serious* frameworks and infrastructure, including the SHIPv5 Boot System with firmware update management
- Drivers and high-level abstractions for on-board peripherals, including UART, SPI, I2C, WiFi, Ethernet, FLASH storage, and more.

From Segger, the following no-cost, pre-licensed, pre-ported and fully supported linkable object libraries are included:

- Segger embOS RTOS kernel, pre-ported and optimized for the platform
- Segger emFile file system, including FAT and embedded file system support with journaling, and all the necessary drivers pre-integrated for the platform
- Segger emUSB-Device USB device/host stacks with various classes, and pre-integrated for the peripherals
- Segger emTCP/IP and TLS/SSL security stacks (including DHCP, web server, ftp, and more), pre-integrated with the WiFi and Ethernet peripherals
- Segger MQTT and CoAP stacks for IoT data connectivity
- Segger emCrypt, the foundational NIST-validated security you need for IoT and device connectivity

This OS and stack implementation is fully supported by *Serious* and is production-licensed for one copy per *Serious* module purchased – there are no additional required fees or licensing to use the Segger object software



with the SCM. Source code and Segger-direct support is available as an upgrade from Segger with a discount for *Serious* customers.

In addition to these ingredients, SHIPWare includes numerous application level frameworks, drivers, and example code for developing a communicating and controlling application, including heap and buffer management, the SHIPBridge device and host protocol stacks for communicating with the HMI. This software is provided in source code format and is fully supported by the Serious team.

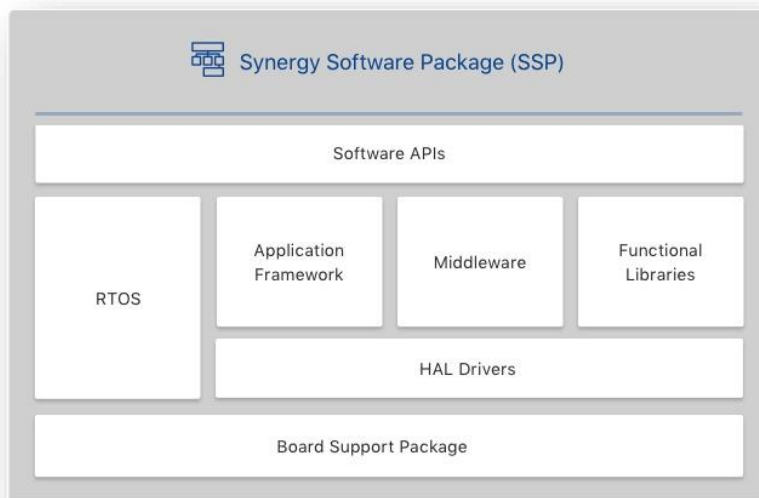
PRODUCTION LINE TOOLS

Out of the box, the SCM also includes the SHIPv5 Boot System, including pre-installed boot-strap and boot-loader applications enabling you to install and commission your custom embedded application on the board on the production line using the no-cost SHIPCrane tools or even over-the-air/wire.

RENESAS SYNERGY® SOFTWARE PLATFORM (SSP)

All Renesas Synergy MCUs, including the S3A3 MCU on the SCM307, come with fully licensed OS and stacks packaged in the Renesas Synergy Software Platform (SSP):

- Application framework for abstraction and code re-use
- ThreadX®, a proven commercial RTOS
- X-Ware™, NetX Duo™, NetX Secure™, USBX™, FileX®
- Flexible layered architecture
- Developed under the IEC/ISO-12207 Software Life Cycle process
- Qualified to operate as specified by the SSP datasheet
- Robust common API across Synergy MCUs



The SSP tools and documentation can be downloaded at the [Synergy Software Platform website](#).



Developing with the Renesas Synergy Software Platform (SSP) is supported directly and solely by Renesas. Due to the licensing, distribution, and support model of the SSP, third parties (including *Serious*) are unable to support SSP programming. For a *Serious*-supported development environment, use the [SHIPWare framework](#).

HMI OPTIONS

Most equipment will have some sort of Human Machine Interface (HMI), whether a modern color graphic/touch LCD or an old-school LED or segment display module with membrane keypad type buttons.

There are two basic ways the SCM307 can be connect to an HMI:

- a wire harness to remote HMI subsystem using the RS485/422 connector
- the direct-dock 2x15 pin header on the back of the SCM307 using USB Host, UART, or I2C

CUSTOM LOW-COST HMI

For direct-docked custom HMIs, the system designer can create a simple PCB with (for example) LEDs, a segment display, a membrane keypad, and all controlled/monitored through a simple I2C port expander, UART, and GPIOs available on the 2x15 board-to-board HMI header on the SCM318.

In this example, a designer could build a small PCB with the following ingredients:

- A Newhaven 2 line x 16 character display module (e.g. [NHD-C0216CiZ-FSW-FBW-3V3](#))
- A custom membrane keypad arranged in a 2x4 matrix
- A few indicator LEDs
- 3.3V LDO
- I2C port expander such as the NXP [PCAL6416AHF](#)
- Board-to-board mating 2x15 connector and mounting standoffs

The MCU on the SCM307 could easily scan the keypad, send text to the display, and control the LEDs all through I2C commands. This configuration yields a low cost and straightforward HMI solution for many low end pieces of equipment.

MODERN GRAPHIC/TOUCH LCD HMI

For a more modern HMI experience, the SCM307 can directly dock into a generation 5 Serious Integrated HMI Module ([SIM](#)), including any member of the [SIMx52](#) and [SIMx62](#) families.

Board-to-board communication over UART or USB enables data movement between the HMI and the SCM307 Control/IO subsystem using either Modbus or the SHIPBridge protocol.



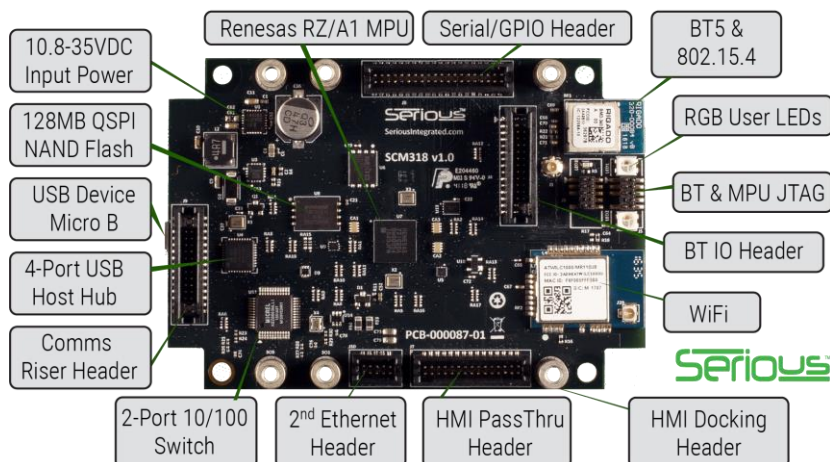
RELATED PRODUCTS

SCM318 COMMS/CONTROL MODULE (SCM)

The SCM318 family is a series of off-the-shelf comms/control modules delivering the processing and communications scalability you need for your next generation of embedded products.

Whether you choose a low end version with just processing and basic RS485 connectivity, or higher end units with WiFi, Bluetooth 5, Ethernet, or other features to link your device to the outside world, all SCM318's come with extensive commercial grade stacks, including OS, TCP/IP, File System, USB device and host, and more to make software development fast and robust.

SIM318 Comms/Control Module



The SCM318 is the perfect complement to the SCM307, with the SCM307 handling the power and IO elements of your product and the SCM318 handling the more sophisticated high-end control and multi-protocol communications.

SIMX52 AND SIMX62 GEN5 SERIOUS INTEGRATED HMI MODULES (SIMS)

Designers can interconnect their SCM307 directly into a Generation 5 Serious Integrated HMI Module (SIM), including the SIMx52 and SIMx62 families via the 30-pin board-to-board HMI Header. The SCM307 provides pass-thru power to the HMI module as well as board-to-board communications via UART and/or USB. The picture on the right shows the SIM552 7" HMI Module's docking connector (1) and the four standoffs (2) used for direct docking the SCM307 into a Serious HMI module.

Alternatively, system designers can decouple the SCM307 physically from other HMI, Comms, and/or Control systems within their chassis by using the RS422/RS485 port on the SCM307. These connectors also contain power inputs/outputs so the remote system can optional power (or be powered by) the SCM307. The SIM552 photo above shows the SIM's RS485/422/power connector (3) in this usage model.



Of course, the SCM307 can be used completely without other Serious products as a cost effective and easy-to-program Control/IO board. Interfacing to custom embedded products through the RS422/485 connector or even custom-designed products using the 30-pin board-to-board connector are possible.

RELATED DOCUMENTS

This document is the *Technical Product Brief (TPB)* for the SCM307 family of Serious Control/IO Modules, and can be (re)downloaded from the mySerious.com portal by registered users as well as by unregistered users from the [SCM307 home page](#).

The Technical Product Brief (TPB) is a high-level document focused on understanding the principles and applications of using and ordering the product, including:

- Hardware and Software Overviews
- Related products
- Order codes
- Usage models
- Dev kits

The TPB should be used in conjunction with the following other documents:

SCM307 DOCUMENTS

SCM307 TECHNICAL REFERENCE MANUAL (TRM)

The Technical Reference Manual (TRM) for the SCM307 family is focused on information necessary to the software, hardware, and systems engineer to integrate and use the features of the SCM307, including:

- Hardware and Software Overviews
- Getting Started
- Detailed hardware feature-by-feature
- Environmental limitations (operating temp etc.)
- DC/AC characteristics
- Physical characteristics (weight etc.)
- Connector summaries
- Port-by-port and signal by signal mappings (SCMs only)

The TRM can be downloaded from the mySerious.com portal by registered users.

SCM307 SCHEMATICS (SCH)

Schematics in PDF format for the SCM307 are available for download at the mySerious.com portal, however the TRM, TPB, and MDP are sufficient for most systems designers to integrate the SCM307 into their systems as well as create add-on expansion boards and products.

SCM307 MECHANICAL DESIGN PACKAGE (MDP)

The Mechanical Design Package (MDP) is a .zip file including 2D dimensioned drawings, 3D PDF, and STEP files. The MDP is downloadable from the mySerious.com portal by registered users.

SHIPWARE AND SEGGER SOFTWARE

Downloads of Serious SHIPWare and Segger software are available for download at the mySerious.com portal for registered users. Documentation for these packages is a combination of the Segger documentation contained in the download as well as the [Serious technical documentation wiki](#).

RENESAS SYNERGY S3A3 MCU DOCUMENTS

The Renesas Synergy® S3A3 MCU has numerous hardware reference manuals and guides; the S3A3 home page can be found on the [Renesas website](#).

RENESAS SYNERGY SOFTWARE PLATFORM (SSP) DOCUMENTS & DOWNLOADS

Renesas Synergy MCUs come with a fully licensed OS and stacks, packaged in the Renesas Synergy Software Platform (SSP). The SSP tools and documentation can be downloaded at the [Synergy Software Platform website](#).



Programming the SCM307 using the Renesas Synergy Software Platform (SSP) is supported directly by Renesas; Serious cannot provide third party support for SSP programming.

ADDITIONAL INFORMATION

Most Related Documents and downloads for the SCM307 are found at the mySerious.com portal.

Order codes for the SCM307 are contained in the SCM307 Technical Reference Manual (TRM).

For technical assistance with the SCM307 and related products:

- Contact a Serious manufacturers' representative
- Contact a Serious authorized distributor
- Visit the technical documentation zone at www.seriousintegrated.com/docs
- Visit mySerious.com
- Contact Serious directly

DOCUMENT INFORMATION AND NOTICES

CHANGE HISTORY AND APPLICABLE PRODUCTS

The following table summarizes major changes to this document and the applicable versions of the product corresponding to this document:

Doc Version	Date	For HW Versions	Major Changes
A0	12-Oct-18	1.0	<ul style="list-style-type: none"> initial

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