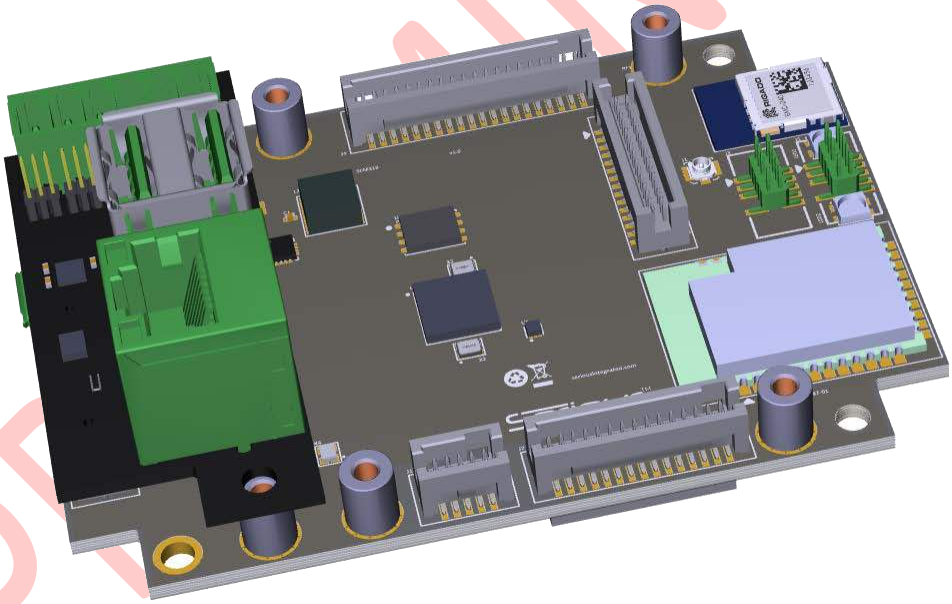
SCM318
Serious Comms/Control Module Family

Technical Product Brief

PRELIMINARY



SCM318 Concept Rendering
with Standard SPM052 Comms Riser Card

DOCUMENT NOTICES

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DOCUMENT INFORMATION

RELATED DOCUMENTS

This document is the *Technical Product Brief (TPB)* for the SCM318 family of *Serious* Comms/Control Modules and can be (re)downloaded from the mySerious.com portal by registered users as well as by unregistered uses from the SCM318 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:

SCM318 Technical Reference Manual (TPM)

The *Technical Reference Manual (TRM)* for the SCM318 family is focused on information necessary to the software, hardware, and systems engineer to integrate and use the features of the SCM318, 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.

SCM318 Mechanical Design Package (MDP)

The Mechanical Design Package (MDP) is a .zip file downloadable from the mySerious.com portal by registered users and contains information for the Mechanical Engineer and PCB/Electrical Engineer:

- 2D dimensional drawings and 3D STEP files of the SCM318, SPM052, and template riser and daughter cards
- Altium projects for blank riser/daughter cards for designers to create their own custom expansion boards

SCM318 Schematics (SCH)

Schematics in PDF format for the SCM318 are available under Non-Disclosure Agreement (NDA) from *Serious,* and when executed, available for download at the mySerious.com portal.

The TRM, TPB, and MDP are sufficient for most systems designers to integrate the SCM318 into their systems as well as create add-on expansion boards and products.

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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.

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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	16-Oct-17	1.0	• Initial internal-only concept
A1	15-Feb 18	1.0	• Updated post customer review cycle
A2	16-Feb 18	1.0	• Added Hardware Key Feature overview, form factor pictures, and description of optional riser/daughter cards and HMI
A3	21-Feb-18	1.0	• Small cleanup incl. clarity on UARTs, CANx2, variant table, input power range
A4	07-Mar-18	1.0	• Revised JST to JST16 on HMI reference for extra GPIO and ability to read FD/HD jumper setting on RS485 (also in SIMx62/x52 TPB) • Revised 26 pin headers to 30 pin headers likewise • Refined variants/part numbers showing Ethernet switch & non-Ethernet A03 option • Added note about RTS/CTS availability on the main UART
A5	20-Mar-18	1.0	• Added port tables
A6	31-Mar-18	1.0	• Block diagram fixes: 485 signames to ABYZ; usbd/h to PT/H40 corrected • RIIC3 no longer available
A7	02-Apr-18	1.0	• Block diagram fixes: USB Micro B moves from SPM052 to mainboard; Riser 30 pin header is M not F, added BT expansion header
A8	18-Apr-18	1.0	• SDCard socket replaced by QSPI SLC NAND 128Mbyte • Revised SPI NOR to 8MB • Revised memory section to show firmware vs file system on NOR vs NAND • Block diagram revised with optional elements (QSPI NAND, Ethernet) • Adjusted description of USB Host Hub and possible hubless variants
A9	21-Apr-18	1.0	• Final VIN range set to 10.8 to 35VDC • Removed IRQ3/4 as customer usable (dedicated to USBD mux manager) • Removed SPDIF and H40 redundant options to get RSPI2 to the H40 connector • Updated USB section to describe USBD switching capability • Updated RIIC1 to show sharing of Ethernet Switch & USB Hub control
A10	16-May-18	1.0	• Updated CAD mockups • Added Chassis Ground reference • Added Bluetooth header description and debugging capability • Added new usage models
A11	08-Jul-18	1.0	• Improved numerous overview sections for readability and clarity • Added “Related Products” section • Updated ordering info (more descriptions, Q318 price book variants) • Added SPM052 info and plug supplier part numbers • Added LIN capabilities and notes on CAN0/LIN shared pins
A12	08-Jul-18	1.0	• Added Related Documents section and migrated hardware detail section to TRM

DOCUMENT CONVENTIONS

This symbol indicates an advanced tip for hardware or software designers to extract interesting or unique value from the Serious Integrated Module.

Pay special attention to this note – items especially subject to change, or related to compatibility, functionality, and usage.

WARNING: You can damage your board, damage attached systems, overheat or cause things to catch fire if you do not heed these warnings.

Notes with this symbol are related to license and associated legal issues you need to understand to use this software. We're big believers in honoring license agreements, so please help the industry by respecting intellectual property ownership.

Some hardware features may be preconfigured or permanently reserved for use by the SHIPEngine software (the GUI management engine component of the Serious Human Interface™ Platform). Notes with this symbol indicate where the module comes pre-configured or uses these resources.

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INTRODUCTION

The SCM318 family of *Serious Communications/Control Modules (SCMs)* is a series of off-the-shelf, high performance, highly configurable and intelligent industrial electronics modules

These modules are designed for use by Original Equipment Manufacturers (OEMs) to add sophisticated IT, IoT, and industrial/factory network connectivity as well as potentially replace custom system control subsystems.

The SCM318 family is powered by the Renesas RZ/A1L (or Renesas RZ/A1LC) MCU: a cost optimized, high performance Cortex A9-based embedded processor with 2MB of on-board RAM for program and data storage. 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.

Various product/feature options (aka "variants") of the family are available with optional features such as WiFi, Bluetooth, Ethernet, RS422/485, onboard Flash memory storage, and more.

The SCM318 can be used stand alone as the central communications and/or control hub of an industrial, medical, or commercial product. It can also directly dock (board-to-board) into the upcoming 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).

The SCM318 family also supports a customer-designed/manufactured daughtercard for access and expansion to GPIO, including the ability to add a PoE power supply to the Ethernet connection, I2C, SPI, UART, and much more.

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.

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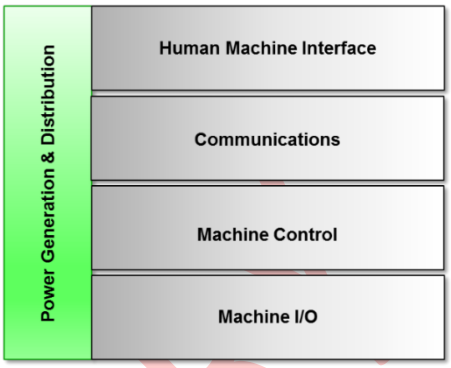
USAGE MODELS

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 the communications (and optionally control) layer(s) of the stack. The software on SCMs is designed to be highly tuned to the OEM's specific system and communications needs, 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 two 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.

All SCM318 variants (aka family members) are designed to take power from an external power source, often an industrial network or in-chassis power supply and convert it down to the voltages required by the hardware. If a PoE power supply daughtercard is added to the SCM318, it can extract 802.3af PoE or 802.3at PoE+ power from the Ethernet input (if present). The daughtercard can be designed to determine which power supply "wins" if both are present.

You control all the software on the SCM318's on-board MCU — forwarding, translating, and filtering the GUI data and any other data between the HMI and your network and between different networks as well as any additional algorithms and system control. For example, you can implement an IoT connector in order to monitor and control your machine from an internet-based control panel. In this case, messages from the cloud, received

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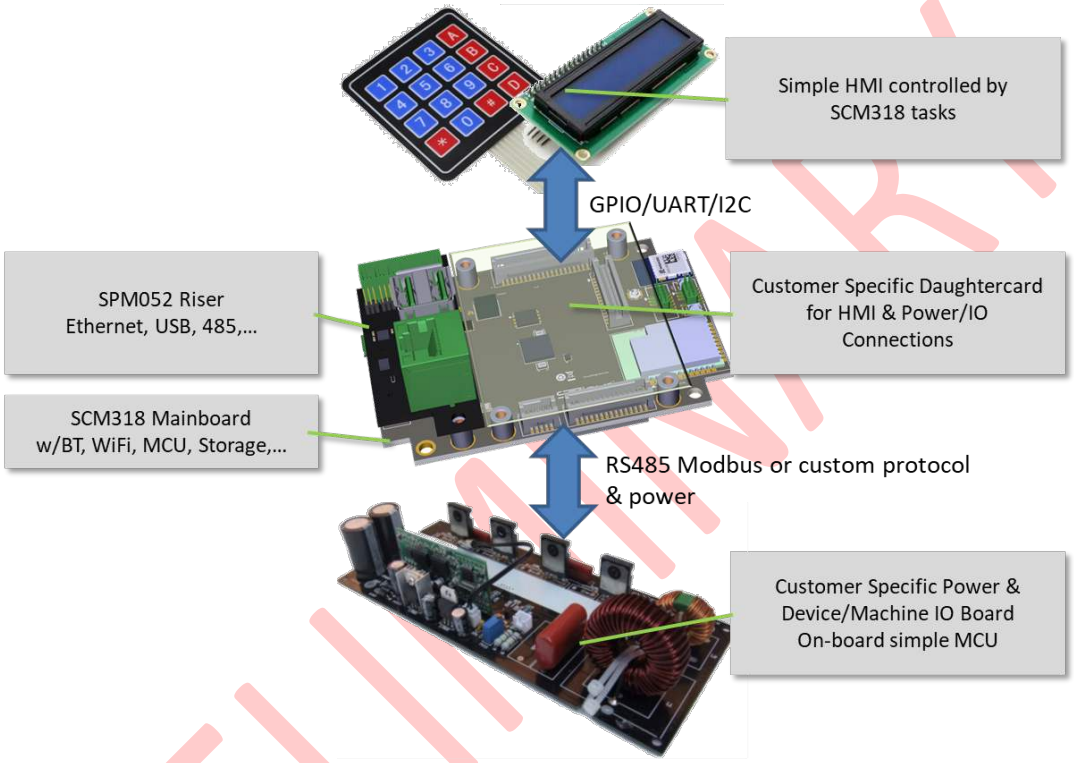
via the WiFi module on the SCM318 into the RZ/A1L MCU, can then be manipulated into control and status requests to the in-chassis machine.

USAGE MODEL 1: COMPLETE SYSTEM COMMS/CONTROL BUILDING BLOCK

In this usage model the SCM318 replaces the high end and custom systems control and comms subsystem in a typical embedded design with an off-the-shelf "embedded app ready" module. Typically, the custom I/O and power system is retained as a semi-intelligent stand-alone building block communicating with the SCM318.



In this configuration, the Power/IO board is commonly co-located with the various wiring harnesses, sensors, and actuators of the machine or product as well as the power input to the chassis. The goal in this topology is to minimize the amount of software in the power/IO subsystem so it can be highly maintainable and sustainable without significant evolution unless the physical capabilities of the product are changed dramatically. The MCU on the Power/IO board can be an inexpensive 8/16 or 32-bit MCU with only a few hundred lines of code, running a super-loop with basic safety/machine state interlocks and polling inputs, controlling outputs, minimally processing/translating sensor data, and providing a simple communications I/O status/control to the "brain" of the system above it – in this case the SCM318. Modbus over RS485 half-duplex/point-to-point is very common as an interconnect, as the Modbus slave stack is only a few hundred lines of easily available code (www.freemodbus.org) and the RS485 connection is highly robust and noise immune.

The "HMI" in this case is a simple membrane keypad and 2x16 UART/I2C driven display module – inexpensive and very pervasive in legacy equipment that has not made the jump to graphic/touch HMI systems. A very simple custom daughtercard on the SCM318 can provide the connectors and ESD protection to attach the keypad and display from a hardware perspective. Typically, the SCM318 would be located near the display/keypad around the front panel of the product. A simple software task on the SCM318 would poll the keypad, including debounce and repeat mechanisms, and generate key up/down "events" delivered to the main

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application task. Similarly, another task might take messages as inputs and deliver them to the LCD module – a "display manager" task. These software algorithms may already exist an existing custom control module and can easily be migrated into the SCM318's application/task framework.

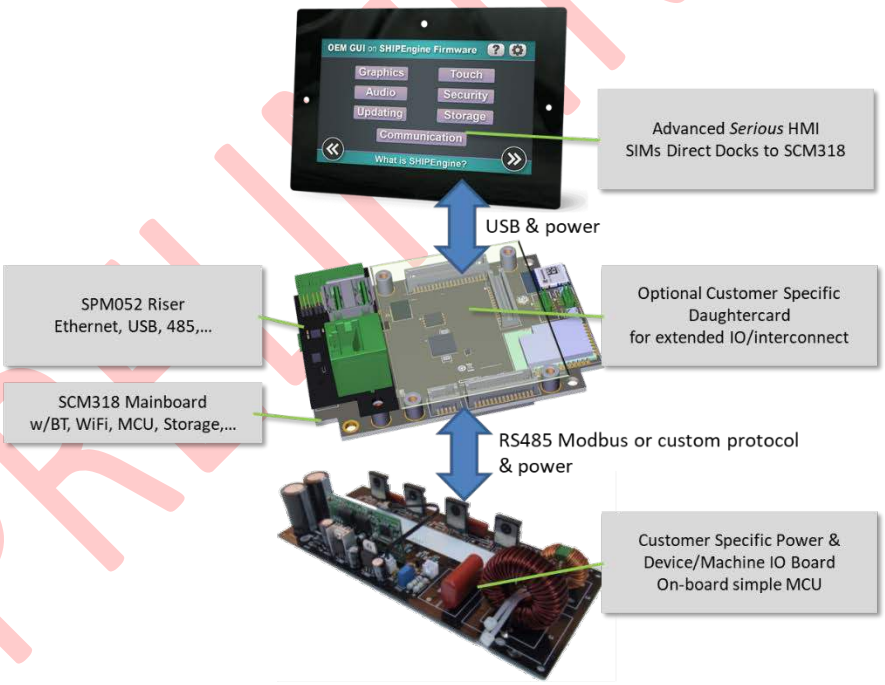
Of course, the SCM318 is in the middle of the whole system, managing the HMI I/O upwards, controlling and monitoring the Power and I/O downwards, communicating externally via WiFi/Ethernet/BT/485/CAN including possibly an on-board web server or MQTT IoT stack or custom or industry standard protocols such as BACNet or Ethernet/IP. The whole product "state machine" of control and status can be operated on the SCM318 as a task.

This topology is highly scalable and sustainable – various Power/IO systems can be swapped out for different types of end products and can even self-identify to the SCM318 software for unified SCM318 software loads across numerous OEM products. The SCM318's communication capabilities can be selectively enabled depending on the end product's positioning and price point.

And... the HMI can scale from the simple type shown all the way to the next usage model: complementing a Serious Integrated HMI Module.

USAGE MODEL 2: OFF THE SHELF COMMS/CONTROL, & GRAPHIC/TOUCH HMI

Similar to the prior usage model, the SCM318 is the comms and control center of the embedded system, with a distributed Power and IO subsystem connected via, in this example, robust differential RS485.



The simple but powerful replacement of the custom membrane keypad and LCD segment display with an off the shelf Serious Integrated HMI Module (SIM) now makes the OEM product modernized with graphic/touch display. All the software to communicate over the dedicated 480mbps USB connection between the two systems is included with both platforms – the *SHIPBridge* protocol ensures efficient and fast data exchange as well as over-the-wire access to each other's file systems and firmware updates. Often, the software written for the SCM318 can remain unchanged as the HMI platform is swapped between small, cost effective HMIs such as

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the 4.3" SIM252 all the way up to the video-playback-capable 10.1" SIM862. This provides a high degree of flexibility in your product line for different sizes of LCD and corresponding cost structures, even though different HMI platforms have often very different MCUs and architectures – without changing your system controller and communications infrastructure.

USAGE MODEL 3: INTELLEGENT REMOTE MACHINE SENSOR/CONTROL

There are many applications where no stand-alone HMI or extensive IO is required. For example, you may want to retrofit older factory machinery or legacy equipment with sensors and potentially some degree of control that can be accessed remotely from the cloud. Numerous business models have appeared over the past decade of companies offering products and services to "instrument" legacy control systems and equipment, bring the data to the cloud, and analyze it for use in optimizing the factory or process.

The SCM318 is an excellent building block for this usage model. With a simple custom daughtercard with the appropriate sensor interfaces, power adaptation, and connectors and the associated software tasks in the SCM318 operating environment, the data can be gathered and delivered by WiFi or Ethernet or RS485 back to gateway, server, or through the network directly to a cloud server.

Extending this concept, you could even add a 4G low bandwidth data radio to the daughtercard, providing true remote data gathering without the need for a local network with internet access.

USAGE MODEL 4: IOT GATEWAY + BLUETOOTH LOCAL NETWORK

You may have, potentially, a collection of equipment or "nodes" within your target environment that all need to be somehow cloud (IoT) connected. Rather than equip each node, or "thing", with all the stacks and capabilities to talk directly to the cloud, the SCM318 enables the capability to create a local network for your "things" and act as a singular gateway to the cloud.

For example, imagine you have a collection of industrial kitchen equipment. Each piece of equipment could have an SCM318, with or without HMI, acting as the main system controller. One of the pieces of equipment, or even a dedicated stand-alone "gateway box" could have an SCM318 with a 4G data uplink. The Bluetooth modules in each SCM318 (based on the Nordic nRF52840 chipset) support full TCP/IP based mesh networking. A powerful but simple mesh network can be created between all the various pieces of equipment, and the one SCM318 with the uplink capability can act as the gateway to the cloud.

Similarly, a modern conference room environmental control system could have an SCM318 with HMI acting as the wall control panel for the room. An RS485 link or Ethernet uplink to BACNet (for building control), DALI (for wired lighting control) as well as WiFi or Ethernet for central server communications can all be deployed on the SCM318 to link the room to the various building control systems. Similar to the previous example, the Bluetooth mesh-networking capability of the Nordic nRF52 chipset can be employed for a room-local network controlling lighting, blinds, projection screens, as well as sampling temperature and motion sensors mounted throughout the room. Additional headless SCM318s could be used to empower motor-driven screens and blinds or other equipment in the room, also networked via Bluetooth for example.

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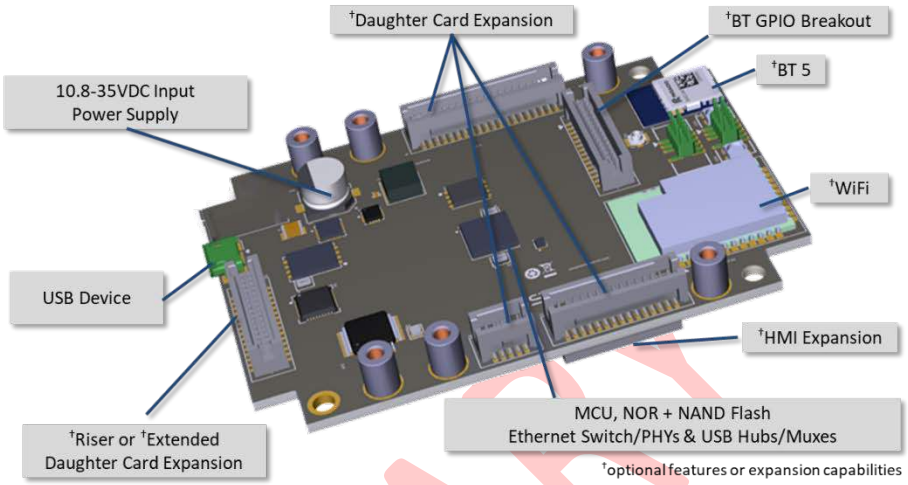
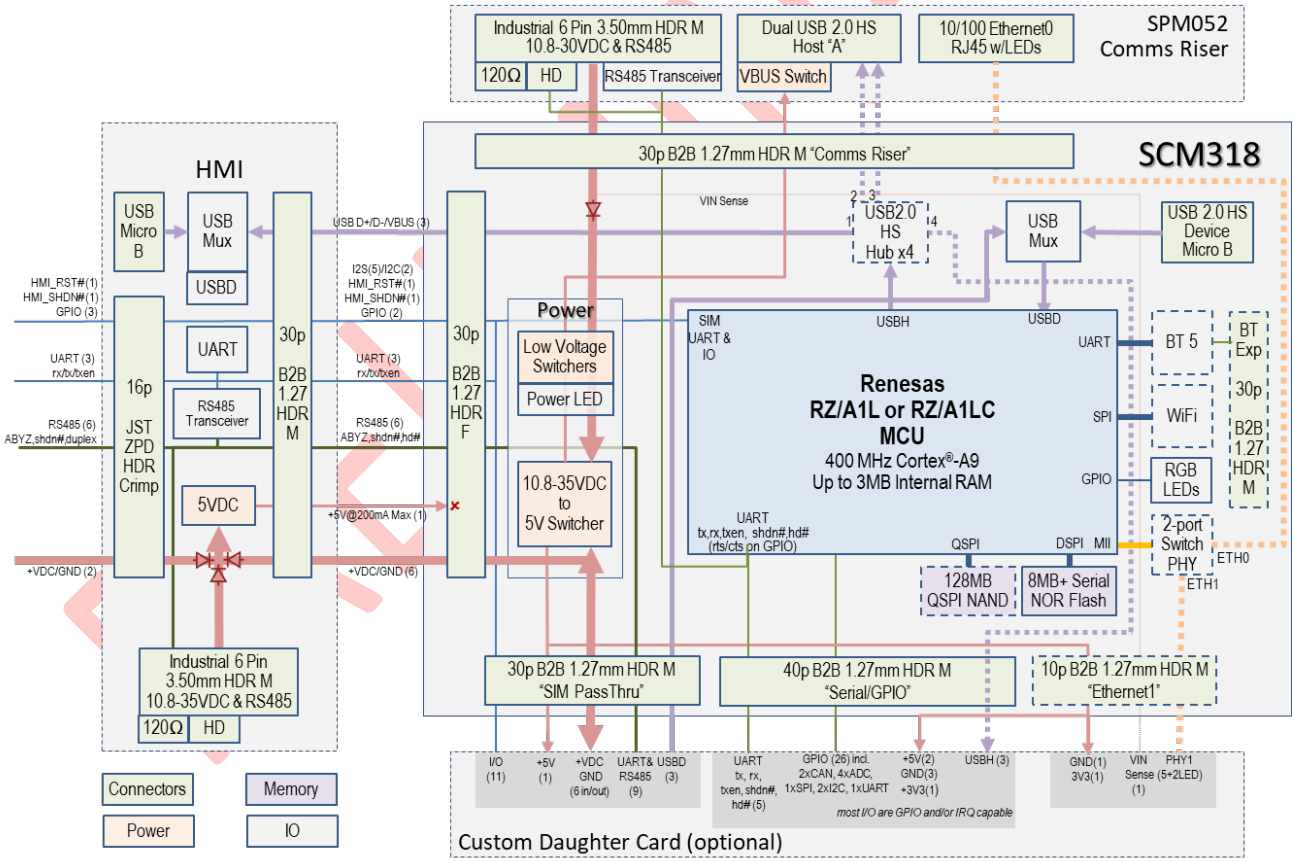
HARDWARE OVERVIEW

The SCM318 is a small single board off-the-shelf industrial-strength module with processor, memory, I/O, power supplies, and wireless and wired networking all built-in.

The system-level architecture of the SCM318 platform, shown below, exposes the power of the Renesas RZ/A1L MCU with extensive expandability and accessibility of the MCU I/O:





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The SCM318 family has numerous members, or "variants". Dashed lines in the figure above indicate variant-dependent options and optional accessories. Depending on the variant, the SCM318 has combinations of the following features:

Powerful ARM Processor & Memory System

- 400MHz ARM Cortex-A9 Renesas RZ/A1LC or RZ/A1L MCU with up to 3MB on-chip RAM
- 8MB Dual SPI Serial NOR Flash for build-in SHIPv5 Boot System code and user application storage
- 128MB QSPI NAND Flash for file and data non-volatile storage (Segger emFile File System stacks included)

WiFi & Bluetooth Wireless

- 802.11bgn 2.4GHz WiFi via a GT1216 (or similar) certified module with the Qualcomm QCA4004 "Kingfisher" chipset
- Bluetooth 5 Thread-capable certified module (Rigado BMD340 or similar) with the Nordic nRF52840 chipset

Ethernet

- Primary port on the **Comms Header**, normally delivered via the **SPM052 Comms Riser Card** as an RJ45 jack
- Secondary switched Ethernet port on the **Ethernet Expansion Header** for off-board addition of magnetics & jack with optional PoE

Serial & Industrial Networking

- 2/4-wire half/full duplex RS485/RS422 with on-board termination option
- 2xCAN and LIN MCU ports exposed for off-board transceiver/network connectivity
- Numerous UART, SPI, I2C MCU ports exposed for off-board connectivity options

USB

- USB device port for programming, updates, and PC connectivity, with secondary override input on **SIM Passthru Header**
- Up to 4 USB Host outputs, including two USB Host A connectors on the **SPM052 Comms Riser Card**

Extensible

- 40-pin board-to-board **Serial Header** (GPIO, ADC, I2C, SPI, UART, etc.) for custom daughtercard expansion
- 30-pin board-to-board **Bluetooth Expansion Header** exposing numerous BT chipset signals
- 30-pin board-to-board **Comms Header**, including Ethernet, dual USB Host, and UART+transceiver control signals normally populated with the **SPM052 Comms Riser Card**
- 10-pin board-to-board **Ethernet Expansion Header**, for 2nd switched Ethernet port expansion and PoE options
- 30-pin board-to-board **HMI Header**, including direct dock option to Gen5 SIMx52 and SIMx62 families

Robust Operating Environment

- 10.8-35VDC wide input power supply
- -40 to +85C operation

The 30-pin **Comms Header** comes pre-populated on many variants with the **SPM052 Comms Riser** Card, which exposes USB, Ethernet, Power, and RS485 industrial networking connectivity.

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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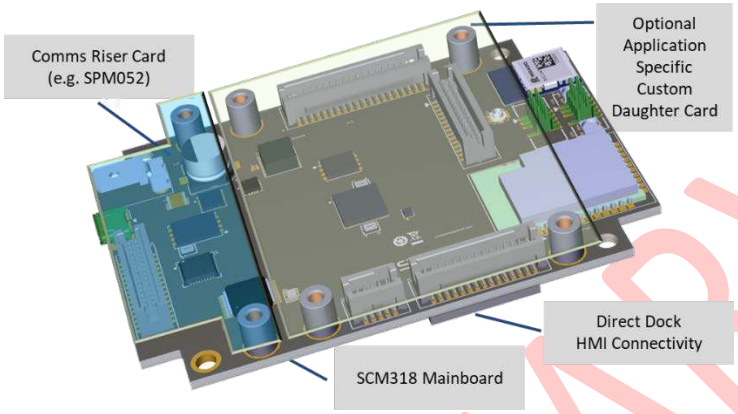
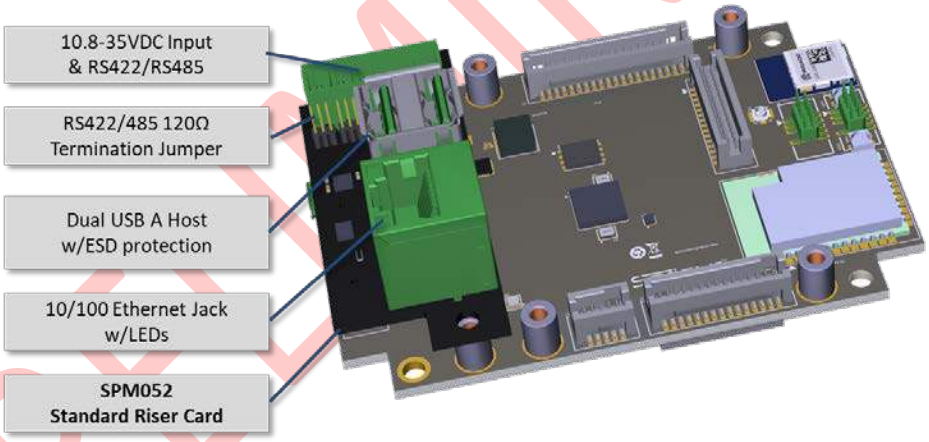
RISER/DAUGHTER CARDS AND HMI EXPANSION

While the SCM318 mainboard can be used stand-alone in many applications, an optional Riser Card, Daughter Card, or HMI Module can be directly attached to the board to extend and complement the capabilities the module.



SCM318 with Optional Riser/Daughter Card(s) and HMI Connectivity

Included with most variants of the SCM318 is the standard SPM052 comms riser card, with the following capabilities:



SCM318 with Standard SPM052 Comms Riser Card

An application specific daughter card can be put adjacent to the SPM052. The SPM052 could be substituted with an alternate implementation (for example, with a PoE+ power supply and RJ45 only). Or, as an option, a single application-specific daughter card can be designed to span the all four connectors (i.e. the whole width of the SCM318) and incorporate both the comms/riser and daughter card functionality all in one PCB.

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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.

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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.

SCM DEVELOPMENT ENGAGEMENT MODEL

There is no cost or royalty for the out-of-the-box software/firmware for Serious Comms/Control Modules (SCMs). However, getting access to this software and firmware for initial development with SCMs requires a one-time "kickstart" engagement with our Services team to ensure a smooth first project experience. First-time access to SCM dev kits and downloads is predicated on having this engagement in place. Once you've been through this initial process, ongoing support (including new revisions of firmware and access to new SCMs) is available at a nominal charge through an annual maintenance and support contract. Contact Serious for details.

IOT AND CLOUD CAPABILITIES

Serious can help you extend your SCM318 to a fully cloud-connected, dashboard-enabled IoT device. We can fully engineer your cloud dashboard, provisioning, security, and even over-the-air/wire push updates and firmware management. In addition, we can manage your ongoing cloud presence, including 24/7 support and customized brand portals. Contact *Serious* for details.

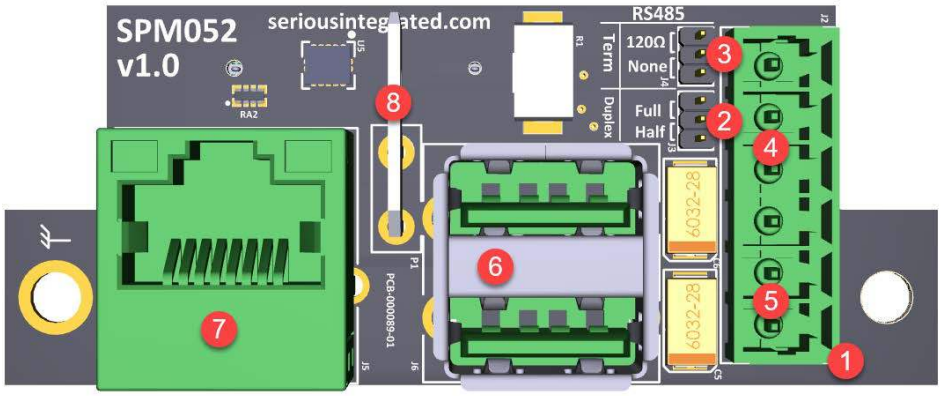
PRELIMINARY

RELATED PRODUCTS

SPM052 COMMS RISER CARD

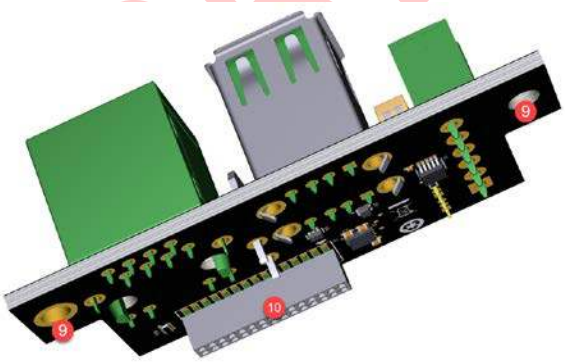
Depending on the order code the SCM318 may or may not come pre-assembled with the Standard SPM052 Comms Riser Card. Designers building their own daughtercards may use SCM318 products without this riser card and duplicate (or not) the SPM052's functionality on their card.

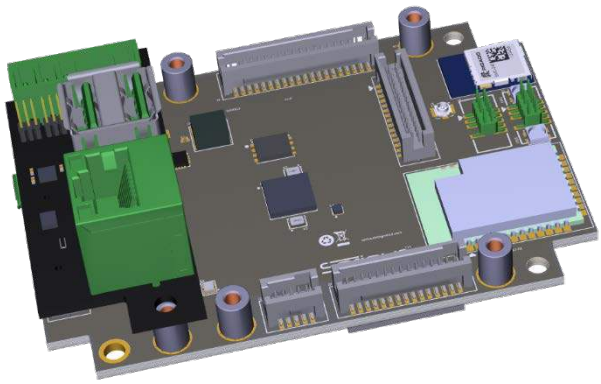
The SPM052 riser card takes signals from the 30-pin Comms Riser Header and, with some conditioning, logic, and transceivers, exposes the following:



Interface	Connector	Description
RS822/485	❶ 6-pin 3.5mm Industrial Header	• ❷ Half/Full Duplex (jumper selectable) • ❸ 120Ω termination (jumper selectable) • ❹ 2 or 4-wire with ❺ power input
USB 2.0 High Speed Host	❻ Dual USB 2.0 A	• Dual Embedded Hosts • Independent VBUS control can power small peripherals
10/100 Ethernet	❼ RJ45 with Dual LEDs	• Standard Primary Ethernet Connection • Non PoE
Chassis Ground	❽ Spade Lug	• Chassis ground wire harness connection

The SPM052 directly docks with ❾ two vibration resistant screws (one of which delivers chassis ground down to the SCM) and ❿ a 30-pin board-to-board header into the SCM308.





SCM208 COMMS/CONTROL MODULE

The prior generation of Serious Comms/Control Modules, the SCM208, has similar variant and price points as the SCM318 but with generally fewer capabilities as summarized here:

	SCM318	SCM208
Processor/Memory		
Processor Frequency/Core	**400MHz ARM Cortex-A9**	240MHz ARM Cortex-M4
Processor Flash/RAM	0MB/2 or 3MB	3MB/640kB
Off-chip Boot/App Storage	**16MB DSPI NOR**	0 (Uses 3MB Internal Flash)
File System Storage	128MB QSPI NAND	**2GB e.MMC**
Wireless		
WiFi	**802.11bgn QCA4004**	802.11bgn QCA4002
Bluetooth	**BT5 w/Thread nRF52840**	BT5 nRF52832
Ethernet		
Primary	**1**[1]	1 w/SPM208 & wire harness
Secondary Switched Port	**1**[3]	none
Serial & Industrial Networking		
RS485/422	**Up to 3 (1**[1] **+ 2**[2]**)**	1x on board
RS232	**Up to 3**[2]	On board; shared w/RS4xx
CAN	**Up to 2**[3]	1x only; on board
LIN	**1**[3]	n/a
UART, SPI, I2C	**Many**[2]	1x UART/I2C on ethernet expansion harness
USB		
USB 2.0 High Speed Device	**1x USB Micro B** **1x override input on SIM Passthru Header**	1x USB Micro B
USB 2.0 High Speed Host	**Up to 4 (2**[1] **+ 1**[3] **+ 1**[4]**)**	none
Extensible		
Serial Expansion	**40-pin board-to-board Serial Header** (GPIO, ADC, I2C, SPI, UART, etc.) for custom daughtercard expansion	1x UART/SPI/I2C + GPIO on 16-pin harness 1x UART/I2C on 10-pin ethernet harness
GPIO Expansion	**40-pin board-to-board Serial Header** has many MCU GPIOs, including interrupts and serial ports	Minimal on 16-pin and 10-pin harnesses
Bluetooth Expansion	**30-pin board-to-board Bluetooth Expansion Header** exposing numerous BT chipset signals	none
Ethernet Expansion	**Primary on SPM052 Comms Header** **Switched 2nd port on 10-pin Ethernet Header**	Single via SPM208 card/harness
HMI Expansion	**30-pin board-to-board HMI Header** **UART & High Speed USB**	60-pin board-to-board HMI Header UART & SPI only
HMI Direct Dock	**Gen5 SIMx52 and SIMx62 families from 3.5" to 10.1" and beyond**	Gen3 & 4 SIM families, incl. SIM115/231/535/243/543
Operating Environment		
Temperature Range	-40 to +85C	-40 to +85C
Voltage Input Range	**10.8 to 35VDC**	9 to 25VDC

[1] via SPM052 Standard SPM052 or custom Comms Riser
[2] via custom comms riser and/or daughtercard
[3] via custom daughtercard
[4] via HMI header

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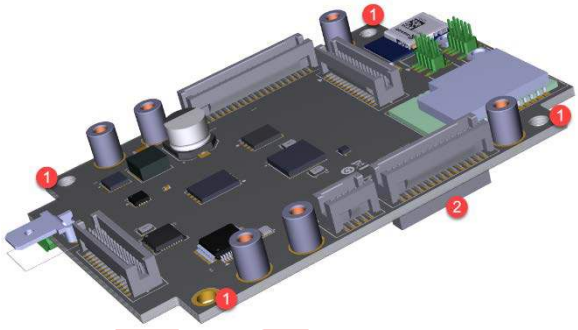
SIMX52 AND SIMX62 GEN5 SERIOUS INTEGRATED HMI MODULES (SIMS)

Designers can interconnect their HMI subsystem into the SCM318 in a variety of ways. Using the off-the-shelf Serious Integrated HMI Modules (SIMs), the SCM318 can directly dock into and communicate with a modern graphic/touch panel forming an even more compelling combined system building block.



All standard variants of the SCM318 family have ❶ 4 corner holes for mounting screws as well as ❷ a 2x15-pin board-to-board HMI Header on the bottom side of the board for direct docking to 5th Generation SIMs such as the SIMx52 and SIMx62 family.

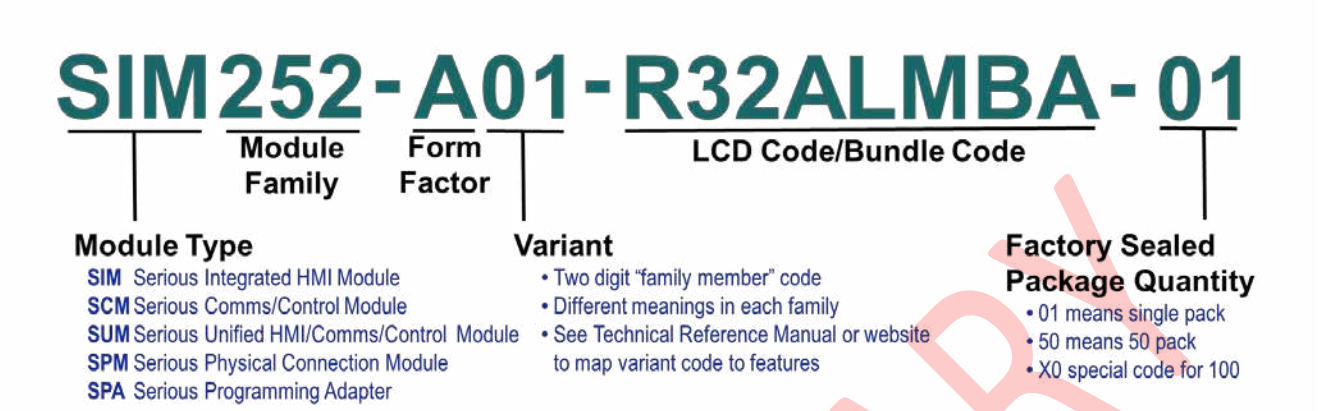
Here is an example of the SCM318 docked into a 7” high performance SIM562 HMI module:

Photo TBD

PRELIMINARY

ORDERING INFORMATION

All Serious modules have order codes with the following basic structure:



PRELIMINARY

FEATURES AND VARIANTS

The SCM318 is a family of communications/control modules. Each variant (aka family member) has a subset of the total feature capability of the family. As of the time of this document's date, the standard variants are:

SCM318	A00	A01	A02	A03	A13
System Features					
Operating Temperature	-40 to +85C				
Power Good LED (Green)	•				
Main Power Input	+10.8 to +35VDC				
Processor/Memory Subsystem					
Renesas 400MHz ARM Cortex-A9 MCU	RZ/A1L				RZ/A1LC
MCU RAM	3MB				2MB
External SPI NOR Flash	16MB				
External QSPI NAND Flash	128MB				
Communication Ports					
10/100 2-port Ethernet Switch	•	•	•		
10/100 Ethernet Ports	1[1,2]+1[2]	1[1,2]+1[2]	1[1,2]+1[2]		
Bluetooth Smart w/NFC™-A Tag	•				
WiFi 802.11 b/g/n	•	•			
RGB LED User Status Indicators	2	2	2	2	2
RS422/485 2-/4-wire w/Transceivers	1[1,2]	1[1,2]	1[1,2]	1[1,2]	1[1,2]
LIN	1[2]	1[2]	1[2]	1[2]	
CAN	2[2]	2[2]	2[2]	2[2]	2[2]
USB2.0 HS Host w/A Connector	2[1,2]	2[1,2]	2[1,2]	2[1,2]	1[,2]
HMI Connectivity					
USB2.0 HS Host	•				
3.3V UART	•				
RESET#/SHDN# Control	•				

[1]On SPM052 standard riser card, check order codes for SCM318+SPM052 preassembled bundles
[2]Available via custom riser and/or daughter card

⚠ These variants and features are preliminary and subject to change

Customer-specific variants are available for sufficient annual volume commitments; contact *Serious* for details.

PRELIMINARY

PRODUCT ORDER CODES

At the time of this publishing, the anticipated initial variants in the SCM318 family are the SCM318-A00 only, which is a superset of all other variants and can be used for development and initial production.

⚠ Note all part numbers and/or features are preliminary and subject to change

SEMI-CUSTOM PRODUCTS

The *Serious* Custom Services team may be able to provide a customized version of the SCM for certain OEM designs, or even a product similar to the SCM318 that directly meets a unique interconnect need.

A simple example might be a semi-custom variant of the SCM. Your design may require a combination of features not on the standard variant list – for example Bluetooth but not Ethernet or WiFi. For sufficient volume, Serious could deliver this as a new semi-custom or even off-the-shelf variant.

Serious can also help your design team deliver custom daughtercards and riser cards that, for example, expose the dual RJ45 ethernet switch capability. Or, for example, that expose dual CAN transceivers or isolated RS485 with an AC power input option. The possibilities are endless for your own design team or with our help.

Contact your local *Serious* Manufacturers Representative or *Serious* directly for more information.

PRELIMINARY

DEVELOPMENT KITS

The following development kits for SCM318 family are available:

Order Code	Pkg Qty	Description
* SCM318-A00-SJL-01	1	Dev Kit SCM318 superset variant w/SPM052 Standard Comms Riser Includes Segger JLink Lite ARM Debugger and Embedded Studio License

*Initial variants available at product launch

This development kit contains the SCM318-A00 “superset” variant that features all the capabilities of the other variants and can be used to develop applications irrespective of the production target variant.

The development kit includes:

- TBD

PRELIMINARY

SPM052 STANDARD COMMS RISER

The SPM052 Standard Comms Riser can be purchased stand-alone for OEM assembly to any of the SCM318 variants:

Order Code	Pkg Qty	Description
* SPM052-A00-10	10	Comms Riser for SCM318 Family; Ethernet, RS485, 2xUSBH Includes mounting screws; screw plug not included

The 6-position screw plug is not included; there are numerous vendors and styles of this plug depending on the installation constraints, including:

Order Code	Manufacturer	Description
39503-2006	Molex	Conn Eurostyle Block F 6 POS 3.5mm Screw ST Cable Mount 8A/Contact Eurostyle™
39500-5006	Molex	Conn Eurostyle Block F 6 POS 3.5mm Screw RA Cable Mount 8A/Contact Eurostyle™
20020008-C061B01LF	Amphenol	Conn Terminal Block F 6 POS 3.5mm Screw ST Cable Mount 8A/Contact Box
20020004-C061B01LF	Amphenol	Conn Terminal Block F 6 POS 3.5mm Screw RA Cable Mount 10A/Contact Box
EM353306	Cooper	Conn Pluggable Mini Terminal Blocks F 6 POS 3.5mm Screw RA Cable Mount 8A
14310614401000	Harting	Conn Terminal Block F 6 POS 3.5mm Screw ST Cable Mount 10A har-flexicon® Bulk
14310614402000	Harting	Conn Terminal Block F 6 POS 3.5mm Screw RA Cable Mount 11A har-flexicon® Bulk

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SCM318 PRODUCTION PRODUCTS

Many customers develop their own daughtercards with their own specific comms riser card capabilities: the standard products for the SCM318 do not include the SPM052 which must be ordered separately. These standard order codes are as follows:

Order Code	Pkg Qty	Description
* SCM318-A00-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND WiFi BT LIN/CAN/USBH/RS485/Ethernet capable; requires SPM052 or Custom Daughtercard (Factory Sealed 10 Pack)
SCM318-A01-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND WiFi LIN/CAN/USBH/RS485/Ethernet capable; requires SPM052 or Custom Daughtercard (Factory Sealed 10 Pack)
SCM318-A02-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND LIN/CAN/USBH/RS485/Ethernet capable; requires SPM052 or Custom Daughtercard (Factory Sealed 10 Pack)
SCM318-A03-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND LIN/CAN/USBH/RS485 capable; requires SPM052 or Custom Daughtercard (Factory Sealed 10 Pack)
SCM318-A13-10	10	Comms/Control Module RZ/A1LC 2MB CAN/USBH/RS485 capable; requires SPM052 or Custom Daughtercard (Factory Sealed 10 Pack)

*Initial products anticipated at product launch

Part numbers including the bundle/kit code “SPM052” are special order only and include the SPM052 preassembled to the SCM318, and may be ordered as follows:

Order Code	Pkg Qty	Description
* SCM318-A00-SPM052-01	1	Comms/Control Module RZ/A1L 3MB w/128MB NAND WiFi BT LIN/CAN capable; includes SPM052 Comms Riser w/2xUSBH/RS485/Ethernet
SCM318-A00-SPM052-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND WiFi BT LIN/CAN capable; includes SPM052 Comms Riser w/2xUSBH/RS485/Ethernet (Factory Sealed 10 Pack)
SCM318-A01-SPM052-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND WiFi LIN/CAN capable; includes SPM052 Comms Riser w/2xUSBH/RS485/Ethernet (Factory Sealed 10 Pack)
SCM318-A02-SPM052-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND LIN/CAN capable; includes SPM052 Comms Riser w/2xUSBH/RS485/Ethernet (Factory Sealed 10 Pack)
SCM318-A03-SPM052-10	10	Comms/Control Module RZ/A1L 3MB w/128MB NAND LIN/CAN capable; includes SPM052 Comms Riser w/2xUSBH/RS485 (Factory Sealed 10 Pack)

Included with each production module are the four (4) stainless steel nylon-patch screws for use with an associated HMI module.

See the variant options table for detailed information on features per variant.

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ADDITIONAL INFORMATION

This information is preliminary and provided prior to production release for advance planning for our customers. Further information is available directly and only from Serious until production release.

Upon production release, the home page for SCM3188 technical documentation, including schematics, 3D STEP files, and more, will be www.seriousintegrated.com/docs.

For technical assistance with the SCM318:

- Contact a Serious manufacturers' representative
- Contact a Serious authorized distributor
- Visit mySerious.com
- Contact Serious directly

PRELIMINARY