

SIMx62

Technical Product Brief (TPB)



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Technical Product Brief (TPB)

Change History and Applicable Products

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

Doc. Version	Date	For HW Versions	Major Changes
A0	19-Feb-18	1.0	Initial internal-only draft
A1	22-Feb-18	1.0	Post customer feedback & initial design scrub ready for internal review
A2	09-Mar-18	1.0	- Grammar and typos - Changed JST12/14 references to JST16 and 26-pin to 30-pin header per SCM318 final, including three GPIO (vs. 2) and duplex read signal from jumper - Added optional I2C/I2S connections to HDMI variant which enables audio over HDMI capability
A3	21-Apr-18	1.0	- Final VIN spec 10.8 to 35VDC - Fixed remaining references to JST14 (to JST16) - Removed erroneous USB Host endpoint restriction
A4	29-Jun-18	1.0	- Added integrated audio codec/amp/line-out feature, including I2C+I2S external option on SC connector - Updated order codes - Corrected GPIO to 2 (from 3) for JST16 and SCM connector
A5	07-Jul-18	1.0	- Typos - Refined variant table to show RTCC and Audio
A6	08-Jul-18	1.0	- Refined Ordering Information section with more part number/LCD code descriptive information - Refined order code tables to include descriptions
B0	04-Aug-18	1.0	- Typos and formatting - Moved many details and ordering info (except dev kits) to TRM
B1	06-Aug-18	1.0	- Typos/formatting/readability
B2	27-Aug-18	2.0	- 16-Pin Wire Harness Connector, UART Port and GPIO not available on v1.0 Limited Production units, only on v2.0 and higher

Introduction

The HMI Module **SIMx62** is a series of intelligent Human Machine Interface (HMI) platforms embeddable in Original Equipment Manufacturers' (OEMs') products. The modules can deliver high-performance user experiences including full motion, full screen 24fps video playback.

Powered by the Renesas RZ/G1E Dual 1GHz Cortex-A7 MPU, the modules incorporate the graphical controller, LCD interface technology, touch sensing, and all the storage and processing necessary to deliver a rich user experience. The off-the-shelf platform (SHIP) firmware engine is preloaded to execute user interfaces developed in the SHIPTide GUI development tool.

Various families within the group are anticipated, including integrated LCD families such as the SIM362 (5"), SIM562 (7"), SIM862 (10"), and even headless output versions (SIM062) with an HDMI output

connector for an external large screen display. Even within a given family, for example the SIM562, there are numerous LCD options for brightness, backlight longevity, touch technology, etc. to meet the cost and usability needs of the end-system designer.

Designed to easily integrate into an OEM's system, the modules feature a wide 10.8-35VDC input power supply and wide operating temperature.

The **SIMx62** can be used stand-alone in a system, connected either directly inside the system chassis to an OEM control subsystem or remotely (for example) over an RS485 type network running Modbus. While primarily designed to deliver the Human Machine Interface (HMI), a **SIMx62** is capable of some measure of system control through its powerful built-in scripting language and operating environment. The modules feature native 3.3V UART, 480Mbps USB2.0 Host and Device, and RS485 connectivity with several protocols supported including Modbus (Master/Slave, ASCII/RTU) and the more powerful SHIPBridge protocol for bidirectional data movement and firmware management.

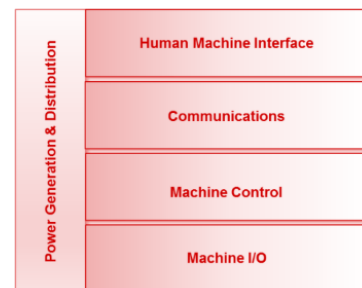
To add rich cloud or network connectivity (including expanded protocols e.g. Ethernet/IP, TCP/IP, CAN, etc.) as well as increase the sophistication and power of the machine control, a compatible Communications/Control Module (SCM) can be directly docked into the back of any SIMx62 platform. For example, the SCM318 can add sophisticated IT, IoT, and industrial/factory network connectivity as well as potentially replace custom system control subsystems and features WiFi, Bluetooth 5, Ethernet, CAN, RS485, on-board processing, and more.

There are numerous other HMI and Communications modules available: for a complete list see <https://smarttouchsurfaces.com>.

Usage Models

Most original equipment manufacturer (OEM) system architectures can be visualized as a functional stack comprised of four (4) key layers:

1. **Human Machine Interface (HMI):** Traditionally consisting of lights and buttons, HMIs are now transitioning to intelligent graphic/touch LCD panels.
2. **Communications Hub:** This layer manages all communication between the HMI and the machine, as well as external connections to cloud services and industrial/enterprise networks.
3. **Intelligent Machine Control:** Responsible for sequencing, safety algorithms, and monitoring of low-level machine input/output (I/O).
4. **Low-Level Machine I/O:** Includes actuators, sensors, and controls that directly impact the physical operation of the system.



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

e₂ip's SIMs modules are off-the-shelf complete solutions to the HMI front panel, including no-cost rapid GUI development tools and software 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.

Communications Modules (SCMs) are off-the-shelf hardware solutions to the communications layer 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 **e₂ip technologies** 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.

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.

Built-In Firmware

Every Integrated HMI Module (SIM) includes the no-cost SHIP firmware suite built-in.

The firmware includes boot loaders (SHIPPaddle and SHIPTug) in the SHIP v5 Boot System, as well as the SHIPEngine runtime GUI management and execution engine which runs GUIs developed by the SHIPTide GUI Development Tool.

SHIPTug and SHIPEngine also include the SHIPBridge Protocol for remote system management, updates, and file and data transfers over-the-wire. The widely implemented Modbus protocol is also supported in SHIPEngine GUIs.

This firmware is fully supported and validated by e₂ip technologies, and includes all drivers, stacks, OS, rendering, and more. Regular updates are available from e₂ip technologies and can be provisioned at system assembly time, in the field via USB A Host Connector or μ SDCard Socket with thumb drives/memory cards, or even over the air/wire depending on connectivity provided.

GUI Development

Developing a complete graphic user interface (GUI) can be a complex, time consuming, and expensive endeavor. Often tens of thousands of lines of custom C code need to be developed in conjunction with custom hardware drivers and off-the-shelf libraries. For rapid GUI development, the platform SHIP offers PC-based GUI design tools and rapid GUI prototyping, development, and deployment. With minimal coding you can create attractive and functional GUIs in a fraction of the time of C-based development.

Development Kits

Modules included in **SIMx62** development kits are identical to production modules. However, the kits also include handy extras for use in early system integration and development, including:

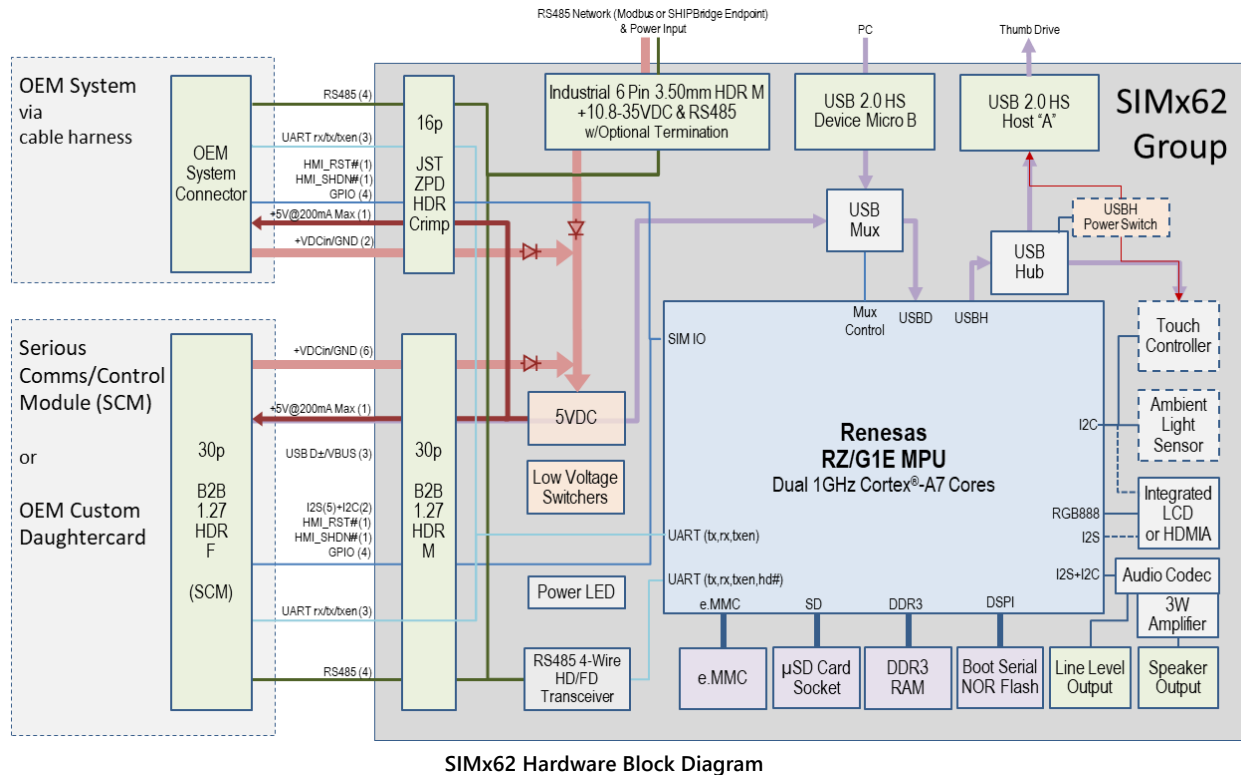
- Example demonstration bezel to mitigate ESD and physical handling damage during development and carrying the dev kit into meetings and demonstrations
- A 16-pin wire harness for prototyping that can plug into the 16-Pin Wire Harness Connector, as well as a business-card sized wire chart for the harness showing the pinout and signals and colors of the wires
- A 6-pin screw terminal plug that can plug into the 6-pin Power/RS485 Connector
- A 12VDC wall power adapter (120/240VAC capable)
- Barrel jack conversion adapters from the barrel plug on the wall adapter to the wires of the example harnesses.
- A female push-on spade lug wire for connecting the chassis ground to either a system chassis ground, or, in the absence of such, looping over to a digital signal ground on the 6-pin Power/RS485 Connector.

For non-touch applications, the resistive touch kit can be used.

Hardware Overview

While the **SIMx62** group has numerous specific family members (aka “variants”) with subset capabilities, the family has the following features:

- Processor and Memory
 - Renesas RZ/G1E Dual 1GHz Cortex A7 MCU
 - 128MB DDR1333 DDR3 DRAM with 8MB boot Serial NOR Flash
 - 4GB e.MMC storage for program, non-volatile data, and file system storage
 - μ SDCard socket for (user supplied) memory cards for file system expansion and firmware/GUI updates
- Integrated graphics/touch and audio I/O
 - Integrated LCD with touch controller or HDMI A headless version for external 720p monitor connections
 - Ambient Light Sensor for high brightness LCD options
 - Integrated audio codec with headphone/line-level and 3W speaker amplifier outputs; external codec/amplifier option
- Numerous communications ports:
 - USB 2.0 high speed 480Mbps embedded host port A connector
 - USB 2.0 high speed 480Mbps device port Micro B connector
 - RS422/485 port with selectable duplex and termination
 - 3.3V UART with transmit control
- Simple in-chassis connectivity
 - Direct Dock to Generation 5 Comms/Control Modules (SCMs, e.g. SCM318) via the 30-Pin Expansion Header
 - RS485, UART, Power, and control via the 16-Pin Wire Harness Connector
 - RS485 and power via the 6-pin Power/RS485 Connector
 - Audio output via the Audio Line Out Connector and Audio Speaker Out Connector
- 10.8-35VDC wide range power supply input
- -40 to +85°C operating temperature range components (further limited by LCD option)



Not all features are available on all **SIMx62** families and variants (family members). Dashed lines in the figure indicate variant-dependent options and optional accessories. For a more detailed hardware description, see the **SIMx62** Technical Reference Manual (TRM).

Power

The **SIMx62** group modules can be powered by most 10.8-35VDC power inputs. The on-board power converters are tolerant of most embedded system supplies, however in harsh power environments (for example, automotive applications), additional filtering and clamping is strongly recommended.

This input power can be supplied through the 6-pin Power/RS485 Connector, the 16-Pin Wire Harness Connector, or the 30-Pin Expansion Header.

Consult the **SIMx62** Technical Reference Manual (TRM) for input power requirements for each family member, as the power budget varies significantly based on the specific variant and attached LCD.

Environmental

All components of the **SIMx62** group family members are rated for -40 to +85°C ambient temperature operation.

However, integrated LCD models will often have their operating temperatures limited by the temperature range of the LCD itself. The LCD code in the part number for each specific **SIMx62** module encodes the temperature range for the associated LCD. An LCD code part number decoder can be found here, and the LCD-adjusted temperature range of each specific family member can be found in the **SIMx62** Technical Reference Manual (TRM).

Processor and Memory

The heart of the **SIMx62** family is the Renesas RZ/G1E MPU, a high-performance processor with dual 1GHz ARM Cortex A7 cores. Most variants of the **SIMx62** include 128MB of high performance DDR3 DRAM for volatile storage of programs and GUI data.

The RZ MCU boots from **e2ip technologies** firmware stored in a dedicated partition in the on-board Flash memory and through a series of boot stages (described in the SHIPv5 Boot System). The SHIPEngine GUI rendering application, included with every SIM, loads and operates the GUI file(s) created by the SHIPTide GUI development tool.

SIMx62 modules typically include 4Gb of on-board non-volatile storage in the form of an embedded MultiMediaCard, or e.MMC. The main partition of the e.MMC is formatted as an embedded file system for storage of user files, including images, video playback files, audio files, configuration data, and more.

Some **SIMx62** variants also have an μ SDCard Socket and/or USB Host Port "A" Connector, both of which can be used for removable storage expansion. These can be used in a variety of ways, for example:

- Permanently installed to expand on-board file storage capability
- Occasionally installed to upgrade firmware, files, or GUIs
- Removed and replaced with (say) advertising images or training videos that change from time to time.

The SHIP Platform firmware for the **SIMx62** supports file system access within user GUIs.

The SIMx62 built-in firmware (SHIPTug, SHIPEngine) can optionally/automatically upgrade firmware and GUIs on the SIMx62 on insertion of removable media.

The SHIPEngine firmware for the **SIMx62** supports on-board and removable media file system access within user GUIs.

An attached Communications/Control Module (SCM) communicating via the SHIPBridge protocol can remotely access the file systems over-the-wire.

Comm Ports and Protocols

Each SIMx62 module includes numerous physical connectors for communications, including:

- USB Host Port "A" Connector
- USB Device Port Micro B Connector
- 6-pin Power/RS485 Connector
- *16-Pin Wire Harness Connector
- 30-Pin Expansion Header

The physical protocols of 3.3V UART, RS422/485, and USB Host/Device are carried on these various connectors.

The **SIMx62** built-in firmware supports numerous built-in protocols including Modbus and SHIPBridge which can be used over many of these connectors.

Consult the **SIMx62** Technical Reference Manual (TRM) for a more detailed description of ports and protocols supported on each connector.



The 16-Pin Wire Harness Connector is not available on v1.0 Limited Production (LP) hardware; see the **SIMx62** Technical Reference Manual (TRM) for details.

Audio

Many variants of the **SIMx62** include an on-board audio codec and amplifier combination. The Audio Line Out Connector supports line-out and headphone applications. The SIMx62 also has a built-in speaker amplifier that can drive up to 3W into a 4Ω speaker via the Audio Speaker Out Connector. This output power will meet the needs of many products without having to use an external high-power amplifier.

The modules also support audio outputs to external codec/amplifiers via an I2S digital output on the 30-Pin Expansion Header.

Connectors

The **SIMx62** hardware will often be used inside a device or machine chassis where other OEM-unique electronics and controls are present.

See the **SIMx62** Technical Reference Manual (TRM) for detailed descriptions (including pinouts, DC characteristics, and protocols supported) of these SIMx62 connectors:

USB Device Port Micro B Connector

A PC (or embedded host) supporting CDC/Raw, CDC/Modbus, or the SHIPBridge Protocol (over CDC or vendor class) can connect via a simple USB cable to the USB Device Port Micro B connector. The SIM cannot be powered through this connector.

USB Host Port “A” Connector

If the attached device can be controlled via CDC/Raw, CDC/Modbus, or the SHIPBridge Protocol (over CDC or vendor class), a simple USB cable can connect the embedded USB Host Port “A” connector to the rest of the system. A storage media thumb drive can also be inserted in this connector for firmware updates as well as GUI file access.

μSDCard Socket

Some **SIMx62** variants include a μSDCard socket designed to accommodate most off-the-shelf memory cards.

6-Pin Power/RS485 Connector

An industrial 6-pin 3.5mm screw-terminal-plug connector provides the simplest single way to connect to a **SIMx62** module with power and RS422/RS485.

Most **SIMx62** variants include an on-board RS485 Transceiver supporting 4-wire and 2-wire connections with on-board termination and half/full duplex options.

16-Pin Wire Harness Connector

When more complex connectivity or control is required than the 6-pin Power/RS485 Connector, the 16-pin wire harness connector supports a robust, vibration-resistant locking mechanism with crimp type pins in the housing. The connector shares the six RS485 and power signals with the 6-pin Power/RS485 Connector and 30-Pin Expansion Header. In addition, like the 30-Pin Expansion Header, the 16-pin wire harness connector includes:

- SIM_RESET# and SIM_SHDN# external reset and shutdown control signals
- GPIO0/1/2/3 as general purpose 3.3V I/O signals controllable from within GUIs
- 3.3V UART and RS485/422 ports



This is connector not available on v1.0 Limited Production (LP) hardware; see the **SIMx62** Technical Reference Manual (TRM) for details.

30-Pin Expansion Header

A 30-pin, 1.27mm pitch dual-row board-to-board header enables the most flexible expansion capability for the SIM. With 7mm board-to-board spacing, double sided SMD as well as through hole components can be supported on a custom PCB plugged into this header. Several off-the-shelf new Comms/Control Modules (SCMs) are capable of docking directly into this socket, for example the SCM318.

This 30-pin header shares the same signals as the 16-Pin Wire Harness Connector. In addition to these common signals, it also enables an external USB2.0 High Speed Host to connect to the SIM directly and an I2S audio channel to connect to off-board codecs and integrated codec/amplifiers.



On v1.0 Limited Production (LP) hardware the functionality of this connector was limited; see the **SIMx62** Technical Reference Manual (TRM) for details.

Audio Line Out Connector

The **SIMx62** family has a built-in codec with line out connector for driving headphones or externally powered speakers. A 2-pin wire harness/crimp-pin connector provides connectivity for this purpose.

Audio Speaker Out Connector

The **SIMx62** also has a built-in speaker amplifier that can drive up to 3W into a 4Ω speaker. This output power will meet the needs of many products without having to use an external high-power amplifier. A 3-pin wire harness/crimp-pin connector provides connectivity for this purpose.

Chassis Ground Spade Lug & Standoffs

Chassis ground is independent from signal ground on the **SIMx62** modules and a dedicated 0.25" male spade lug as well as specific board-to-board standoffs enable connecting this chassis ground signal to the system chassis ground.

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 e₂ip technologies until production release.

Upon production release, the home page for **SIMx62** group technical documentation, including schematics, 3D STEP files, and more, will be <https://www.myserious.com/login/>

For technical assistance with the **SIMx62**:

- Contact an **e₂ip technologies** manufacturers' representative
- Contact an **e₂ip technologies** authorized distributor
- Visit <https://smarttouchsurfaces.com>
- Contact **e₂ip technologies** directly

Document Notices & Conventions

Important Legal Notice

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e₂ip reserves the right to relocate components on the **SIMx62** typically for manufacturability, cost, and other product and BOM optimization related reasons. Do not assume a specific **SIMx62** component placement to utilize the inner-stack-height more than the guidelines as this may cause daughtercard mechanical conflicts in future **SIMx62** revisions.

See the **SIMx62** Mechanical Design Package (MDP) for acceptable height envelope guidelines.

Trademarks & Copyrights

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Document Conventions



This symbol indicates an advanced tip for hardware or software designers to extract interesting or unique value from the **SIMx62**.



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.

Related Documents

The **Technical Product Brief (TPB)** can be downloaded from the <https://smarttouchsurfaces.com> website from the <https://smarttouchsurfaces.com/documentation-files/>

The TPB is a higher-level document focused on understanding the principles and applications of using and ordering the product, including:

- Hardware and software overviews
- Related products and development kits
- Usage models

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

SIMX62 Technical Reference Manual (TRM)

The **Technical Reference Manual (TRM)** is focused on detailed information necessary to the systems engineer to integrate and use the features of the modules, including:

- Hardware & Software Overviews
- Getting Started
- Handling precautions

- Environmental limitations and DC characteristics, including power consumption and voltage specifications
- Physical characteristics (weight, etc.)
- Hardware detail feature-by-feature
- Connector summaries
- Production module order codes

The TRM can be downloaded from the <https://www.myserious.com/login/> portal by registered users.

SIMX62 Mechanical Design Package (MDP)

The **Mechanical Design Package (MDP)** is a .zip file downloadable by registered users from the <https://www.myserious.com/login> portal & contains information for the Mechanical Engineer and PCB/Electrical Engineer, including 2D dimensional drawings and 3D STEP files of the various **SIMx62** series HMI modules, as well as a template for designers to create their own custom expansion boards.

Software Reference Manuals and Support

For software downloads, support, example projects, training, and reference material, consult the Documentation Zone of the <https://www.myserious.com/login/>.

e₂ip technologies – Value Added Solutions

Customer-specific variants & customization of the **SIMx62** series HMI modules are available for sufficient annual volume commitments. Additionally, e₂ip technologies can offer services to further customize or complement **SIMx62** series modules with additional complimentary technologies:

- Smart Touch Surfaces
- SMART STRUCTURAL SERVICES™ (IME)
- Advanced Membrane Switches
- Capflex® Capacitive Switches
- ClickTouch™ Switches
- 5G Smart Surfaces
- Printed Sensors
- Printed Heaters
- Lumifilm®
- Project Management
- Ideation, Design
- Engineering & Manufacturing
- Certifications & Testing (ISO13485 and more)

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