conga-SA8

SMARC® 2.1 Module with Intel® Alder Lake-N and Intel® Amston Lake SoCs

User's Guide

Revision 0.02 (Preliminary)

Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
0.01	2024-09-19	AEM	• Preliminary manual
0.02	2025-03-10	AEM	• Added the WEEE directive to the preface section • Added the variants with PN:051416, PN:051417, PN:051418 and PN:051419 • Deleted the variant with PN:051414 • Added a note about 3D models to section 2.3 “Mechanical Dimensions” • Changed the note icon in section 2.8.2 “Cooling Solution” to caution icon

Preface

This user's guide provides information about the components, features, connectors and BIOS Setup menus available on the conga-SA8. It is one of three documents that should be referred to when designing a SMARC® application.

The other reference documents that should be used include the following:

- SMARC® Hardware Specification
- SMARC® Design Guide

These documents are available on the SGET website at **www.sget.org**. Additionally, check the restricted area of the congatec website at **www.congatec.com** and the website of the respective silicon vendor for relevant documents (Erratum, PCN, Sighting Reports and others).

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The following symbols are used in this user's guide:

Warning

Warnings indicate conditions that, if not observed, can cause personal injury.

Caution

Cautions warn the user about how to prevent damage to hardware or loss of data.

Note

Notes call attention to important information that should be observed.

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Terminology

Term	Description
cBC	congatec Board Controller
DDI	Digital Display Interface
DTR	Dynamic Temperature Range
eDP	Embedded DisplayPort
eSPI	Enhanced Serial Peripheral Interface
GB	Gigabyte
GbE	Gigabit Ethernet
GHz	Gigahertz
GPIO	General Purpose Input Output
HDA	High Definition Audio
HDMI	High Definition Multimedia Interface
IBECC	In-Band Error Correction Code
I2S	Inter IC Sound
kB	Kilobyte
kHz	Kilohertz
LVDS	Low-Voltage Differential Signaling
Mb	Megabit
MB	Megabyte
MHz	Megahertz
MT/s	Mega-transfers per second
N.A	Not available
N.C	Not connected
PEG	PCI Express Graphics
PCH	Platform Controller Hub
PCIe	PCI Express
PWM	Pulse Width Modulation
SATA	Serial ATA
SPI	Serial Peripherial Interface
TDP	Thermal Design Power
T.B.D	To be determined

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1 Introduction

1.1 SMARC® Concept

The Standardization Group for Embedded Technologies e.V (SGET) defined the SMARC standard for small form factor computer modules that target applications with ultra low power, low cost and high performance. The SMARC connector and interfaces are optimized for high-speed communication, and are suitable for ARM SoCs and low power x86 SoCs.

The SMARC standard bridges the gap between the COM Express standard and the Qseven standard by offering most of the interfaces defined in the COM Express specification at a lower power. With a footprint of 82 mm x 50 mm or 82 mm x 80 mm, the SMARC standard promotes the design of highly integrated, energy efficient systems.

Due to its small size and lower power demands, PC appliance designers can design low cost devices as well as explore a huge variety of product development options—from compact space-saving designs to fully functional systems. This solution allows scalability, product diversification and faster time to market.

1.2 conga-SA8 Options Information

The conga-SA8 design is based on the SMARC 2.1 Specification. The conga-SA8 features the Intel® Atom® and Intel® Core® SoCs. With maximum 15 W TDP processors, the conga-SA8 offers Ultra Low Power boards with high computing performance and outstanding graphics. Additionally, the conga-SA8 supports single channel LPDDR5x memory with up 16 GB capacity and data rates up to 4800 MT/s, multiple I/O interfaces, up to three independent displays and various congatec embedded features.

By offering most of the functional requirement for any SMARC application, the conga-SA8 provides manufacturers and developers with a platform to jump-start the development of systems and applications based on SMARC specification. Its features and capabilities make it an ideal platform for designing compact, energy-efficient, performance-oriented embedded systems.

1.2.1 Options Information

The conga-SA8 is available in nine variants (three commercial and six industrial). The table below shows the different configurations available.

Table 1 Commercial Variants

Part-No		051415	051416	051419
Processor		Intel® Atom® x7425E 1.5 GHz, Quad Core	Intel® Core® 3-N355 1.9 GHz, 8 Core	Intel® Atom® x7425E 1.5 GHz, Quad Core
Burst Freq.		3.4 GHz	3.9 GHz	3.4 GHz
L2 Cache		6 MB	6 MB	6 MB
Graphics Engine		Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics
GFX Base/Burst Freq.		0.80 / 1.00 GHz	1.00 / 1.35 GHz	0.80 / 1.00 GHz
Onboard Memory (LPDDR5x)		8 GB, 4800 MT/s Single Channel	16 GB, 4800 MT/s Single Channel	16 GB, 4800 MT/s Single Channel
eMMC 5.1		32 GB	64 GB	64 GB
Optional Wifi/BT Module		N.A	N.A	N.A
TPM (Discrete)		Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15
SD Card		N.A	N.A	N.A
Procesor TDP (cTDP Down)		12 W (N.A)	15 W (9 W)	12 W (N.A)
CPU Use Condition [1]		Embedded	PC Client	Embedded
CPU Tjunction	Min.	0°C	0°C	0°C
	Max.	105°C	105°C	105°C
DTR (Cold to Hot Transition) [2]		T_{Boot} + 70°C	T_{Boot} + 70°C	T_{Boot} + 70°C
DTR (Hot to Cold Transition) [2]		T_{Boot} - 70°C	T_{Boot} - 70°C	T_{Boot} - 70°C
Compatible Carrier Board		• The conga-SEVAL evaluation carrier board (PN:007010) • The conga-SMC1/SMARC-x86 evaluation carrier board (PN: 020751)		

Note

1. *Intel SoC use conditions. For more information, see Intel documentation.*

2. *T_{Boot} is the boot temperature. If the Tjunction is not within the DTR range, you must reboot the system. See Intel documentation for more information.*

Table 2 Industrial Variants

Part-No		051410	051411	051412	051413	051417	051418	051420
Processor		Intel® Atom® x7835RE 1.3 GHz, 8 Core	Intel® Atom® x7835RE 1.3 GHz, 8 Core	Intel® Atom® x7433RE 1.5 GHz, Quad Core	Intel® Atom® x7433RE 1.5 GHz, Quad Core	Intel® Atom® x7211RE 1.0 GHz, Dual Core	Intel® Atom® x7433RE 1.5 GHz, Quad Core	Intel® Atom® x7835RE 1.3 GHz, 8 Core
Burst Frequency [1]		3.6 GHz	3.6 GHz	3.4 GHz	3.4 GHz	3.2 GHz	3.4 GHz	3.6 GHz
L2 Cache		6 MB	6 MB	6 MB	6 MB	6 MB	6 MB	6 MB
Graphics Engine		Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics	Intel® UHD Graphics
GFX Base/Burst Frequency		0.80 / 1.20 GHz	0.80 / 1.20 GHz	0.60 / 1.00 GHz	0.60 / 1.00 GHz	0.40 / 1.00 GHz	0.60 / 1.00 GHz	0.80 / 1.20 GHz
Onboard Memory (LPDDR5x)		16 GB, 4800 MT/s Single Channel	8 GB, 4800 MT/s Single Channel	8 GB, 4800 MT/s Single Channel	4 GB, 4800 MT/s Single Channel	4 GB, 4800 MT/s Single Channel	16 GB, 4800 MT/s Single Channel	8 GB, 4800 MT/s Single Channel
eMMC 5.1		64 GB	32 GB	32 GB	32 GB	32 GB	64 GB	32 GB
Optional Wifi/BT Module		N.A	N.A	N.A	N.A	N.A	N.A	Intel AX210 Wifi 6E/ BT
TPM (Discrete)		Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15	Infineon SLB9672 FW15
SD Card		N.A	N.A	N.A	N.A	N.A	N.A	N.A
Procesor TDP (cTDP Down)		12 W (N.A)	12 W (N.A)	9 W (N.A)	9 W (N.A)	6 W (N.A)	9 W (N.A)	12 W (N.A)
CPU Use Condition [2]		Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)	Embedded and Industrial (Extended Temperature)
CPU Tjunction	Min.	-40°C	-40°C	-40°C	-40°C	-40°C	-40°C	-40°C
	Max.	105°C	105°C	105°C	105°C	105°C	105°C	105°C
DTR (Cold to Hot Transition) [3, 4]		T_{Boot} + 110°C	T_{Boot} + 110°C	T_{Boot} + 110°C	T_{Boot} + 110°C	T_{Boot} + 110°C	T_{Boot} + 110°C	T_{Boot} + 110°C
DTR (Hot to Cold Transition) [3, 4]		T_{Boot} - 110°C	T_{Boot} - 110°C	T_{Boot} - 110°C	T_{Boot} - 110°C	T_{Boot} - 110°C	T_{Boot} - 110°C	T_{Boot} - 110°C
Compatible Carrier Board		The conga-SEVAL evaluation carrier board (PN:007010)						

Note

1. *Disable Turbo mode for industrial use conditions.*
2. *Intel SoC use conditions. For more information, see Intel documentation.*
3. *T_{Boot} is the boot temperature. If the Tjunction is not within the DTR range, you must reboot the system. See Intel documentation for more information.*
4. *For embedded use condition, the DTR is ±90°C*

2 Specifications

2.1 Feature List

Table 3 Feature Summary

Form Factor	SMARC® form factor specification, revision 2.1 (82 mm x 50 mm)	
SoC	Intel® Core® and Atom® SoCs	
Memory	Onboard non-ECC LPDDR5x memory. Supports - data rates up to 4800 MT/s - up to 16 GB capacity - IBECC (out of band ECC is not supported)	
Chipset	Integrated in the SoC	
Audio	1x HDA	
Ethernet	2x 2.5 Gigabit Ethernet via Intel i226® Ethernet controller (with TSN support)	
Graphics Options	Intel® UHD (Gen 12). Supports: - API (DirectX 12.1, OpenGL 4.6, OpenCL 3.0, Vulkan 1.2) - Intel® QuickSync & Clear Video Technology HD (hardware accelerated video decode/encode/processing/transcode) - up to 3 independent displays (must be two DDI's and one LVDS/eDP/DSI)	
	1x LVDS (dual channel) 1x DP++ 1x HDMI 2.0b (native)	**Optional Interface (assembly option)**: - 1x eDP 1.4 [1] - 1x DP++ (DDI1) [2]
Peripheral Interfaces	1x SATA® 6 Gb/s Up to 4x PCIe® Gen 3 ports 6x USB 2.0 (1x USB dual role) 2x USB 3.2 Gen 2 Up to 4x UART (two with handshake signals) 2x I2C (I2C_GP and I2C_PM)	14x GPIOs 1x SMBus 1x SPI 1x eSPI **Optional Interface (assembly option)**: - M.2 1216 Wi-Fi/BT module [3]
Mass Storage	eMMC 5.1 onboard flash [4]	
BIOS	AMI Aptio® V UEFI 2.x firmware; 32 MB serial SPI with congatec embedded BIOS features	
congatec Board Controller	Multi-stage watchdog, non-volatile user data storage, manufacturing and board information, board statistics, hardware monitoring, fan control, I2C bus, power loss control	
Power Mgmt.	ACPI 5.0 compliant with battery support S5e mode (see section 7.5.5 "Enhanced Soft-Off State") Suspend to RAM (S3) Configurable TDP	
Security	Discrete TPM 2.0 (Infineon SLB9672 FW15)	
Hypervisor	RTS Real-Time Hypervisor	

Note

1. *No LVDS support with this option*
2. *Native HDMI is not supported with this option*
3. *Available by default only on the variant with part number 051420*
4. *Up to 256 GB by assembly option.*

2.2 Supported Operating Systems

The conga-SA8 supports the following operating systems:

- Microsoft® Windows® 11 (64-bit)
- Microsoft® Windows® 11 IoT Enterprise 22H2 (64-bit)
- Microsoft® Windows® 10 (64-bit)
- Microsoft® Windows® 10 IoT Enterprise LTSC 2021 (64-bit)
- Linux Ubuntu 24.04 (64-bit)
- RTS Hypervisor

Note

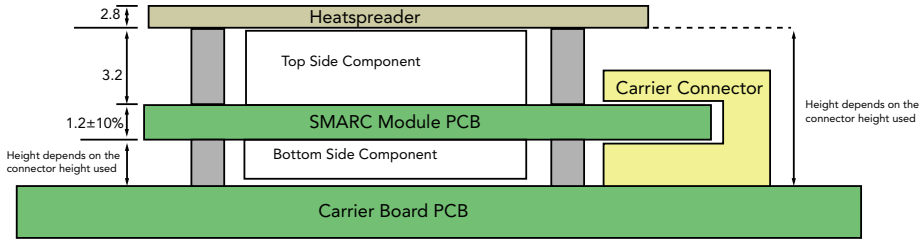
1. *The conga-SA8 supports only native UEFI Operating Systems. Legacy Operating Systems which require CSM (Compatibility Suppport Module) as part of the UEFI firmware are not supported anymore.*
2. *For installation of Windows Operating system, we recommend a minimum storage capacity of 20 GB. congatec will not offer technical support for systems with less than 20 GB storage space.*

2.3 Mechanical Dimensions

The conga-SA8 has the following dimensions:

- length of 82 mm
- width of 50 mm

The overall height (module, heatspreader and stack) is shown below:



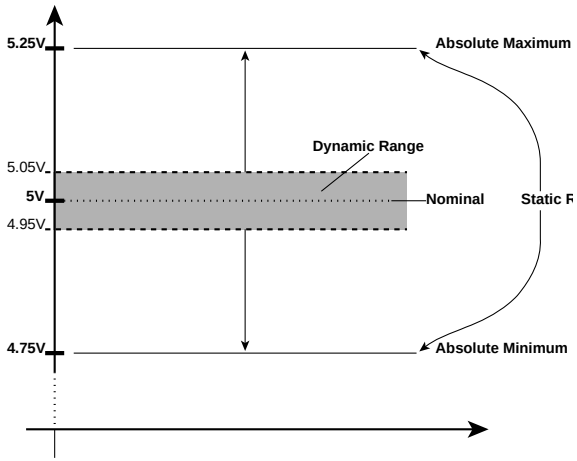
All dimensions are in millimeters

Note

The 3D models of congatec products are available at www.congatec.com/login. These models indicate the overall length, height and width of each product. If you need login access, contact your local sales representative.

2.4 Supply Voltage Standard Power

The conga-SA8 provides a supply voltage range of 4.75 V – 5.25 V.



2.4.1 Electrical Characteristics

Table 4 Module Power

Signal			Min.	Typ.	Max.	Units	Comment
VDD_IN	Voltage	± 5%	4.75	5.00	5.25 V	Vdc	
	Ripple		-	-	± 50	mV_{PP}	0–20MHz
	Current						
VDD_RTC	Voltage		2.5	3	3.3	Vdc	

2.4.2 Rise Time

The input voltages shall rise from 10 percent of nominal to 90 percent of nominal at a minimum slope of 250 V/s. The smooth turn-on requires that, during the 10 percent to 90 percent portion of the rise time, the slope of the turn-on waveform must be positive.

2.5 Power Consumption

The power consumption values were measured with the following setup:

- Input voltage +5 V
- conga-SA8 COM
- conga-SEVA carrier board
- conga-SA8 cooling solution
- Microsoft® Windows® 10 IoT Enterprise

Table 5 Measurement Description

The power consumption values were recorded during the following system states:

System State	Description	Comment
S0: Minimum value	Lowest frequency mode (LFM) with minimum core voltage during desktop idle	
S0: Maximum value	Highest frequency mode (HFM/Turbo Boost)	The CPU was stressed to its maximum frequency
S0: Peak value	Highest power spike during the measurement of "S0: Maximum value". This state shows the peak value over a short period of time (worst case power consumption value)	Consider this value when designing the system's power supply to ensure that sufficient power is supplied during worst case scenarios

System State	Description	Comment
S3	COM is powered by VCC_5V, while in Suspend to RAM state	
S5	COM is powered by VCC_5V, while in Soft-Off state	
S5e	COM is powered by VCC_5V, while in enhanced Soft-Off state	

Note

The peripherals did not influence the measured values because they were powered externally.

Table 6 Power Consumption Values

The table below provides additional information about the conga-SA8 power consumption. The values were recorded at various operating modes.

Part No.	Memory Size	H.W Rev.	BIOS Rev.	OS (64 bit)	CPU			Current (A)					
					Variant	Cores	Freq. / Max. Turbo	S0: Min	S0: Max	S0: Peak	S3	S5	S5e
051410	TBD	TBD	TBD	TBD	Intel® Atom® x7835RE	8	1.3 / 3.6 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051411	TBD	TBD	TBD	TBD	Intel® Atom® x7835RE	8	1.3 / 3.6 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051412	TBD	TBD	TBD	TBD	Intel® Atom® x7433RE	4	1.5 / 3.4 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051413	TBD	TBD	TBD	TBD	Intel® Atom® x7433RE	4	1.5 / 3.4 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051414	TBD	TBD	TBD	TBD	Intel® Core® i3-N305	8	1.8 / 3.8 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051415	TBD	TBD	TBD	TBD	Intel® Atom® x7425	4	1.5 / 3.4 GHz	TBD	TBD	TBD	TBD	TBD	TBD
051420	TBD	TBD	TBD	TBD	Intel® Atom® x7835RE	8	1.3 / 3.6 GHz	TBD	TBD	TBD	TBD	TBD	TBD

Note

With fast input voltage rise time, the inrush current may exceed the measured peak current.

2.6 Supply Voltage Battery Power

Table 7 CMOS Battery Power Consumption (Commercial Variants)

RTC @	Voltage	Current
-10°C	3V DC	TBD µA
20°C	3V DC	TBD µA
70°C	3V DC	TBD µA

Table 8 CMOS Battery Power Consumption (Industrial Variants)

RTC @	Voltage	Current
-50°C	3V DC	TBD µA
20°C	3V DC	TBD µA
90°C	3V DC	TBD µA

Note

1. *Do not use the CMOS battery power consumption values listed above to calculate CMOS battery lifetime.*
2. *Measure the CMOS battery power consumption in your customer specific application in worst case conditions (for example, during high temperature and high battery voltage).*
3. *Consider the self-discharge of the battery when calculating the lifetime of the CMOS battery. For more information, refer to application note AN9_RTC_Battery_Lifetime.pdf on congatec GmbH website at www.congatec.com/support/application-notes.*
4. *We recommend to always have a CMOS battery present when operating the conga-SA8*

2.7 Environmental Specifications

Temperature (commercial variants)	Operation: 0° to 60°C	Storage: -20° to +80°C
Temperature (industrial variants)	Operation: -40° to 85°C	Storage: -40° to +85°C
Relative Humidity	Operation: 10% to 85%	Storage: 5% to 85%

Caution

The above operating temperatures must be strictly adhered to at all times. When using a congatec heatspreader, the maximum operating temperature refers to any measurable spot on the heatspreader's surface.

Humidity specifications are for non-condensing conditions.

2.8 Storage Specifications

This section describes the storage conditions that must be observed for optimal performance of congatec products.

2.8.1 Module

For long-term storage of the conga-SA8 (more than six months), keep the conga-SA8 in a climate-controlled building at a constant temperature between 5°C and 40°C, with humidity of less than 65% and at an altitude of less than 3000 m. Also ensure the storage location is dry and well ventilated.

Note

We do not recommend storing the conga-SA8 for more than five years under these conditions.

2.8.2 Cooling Solution

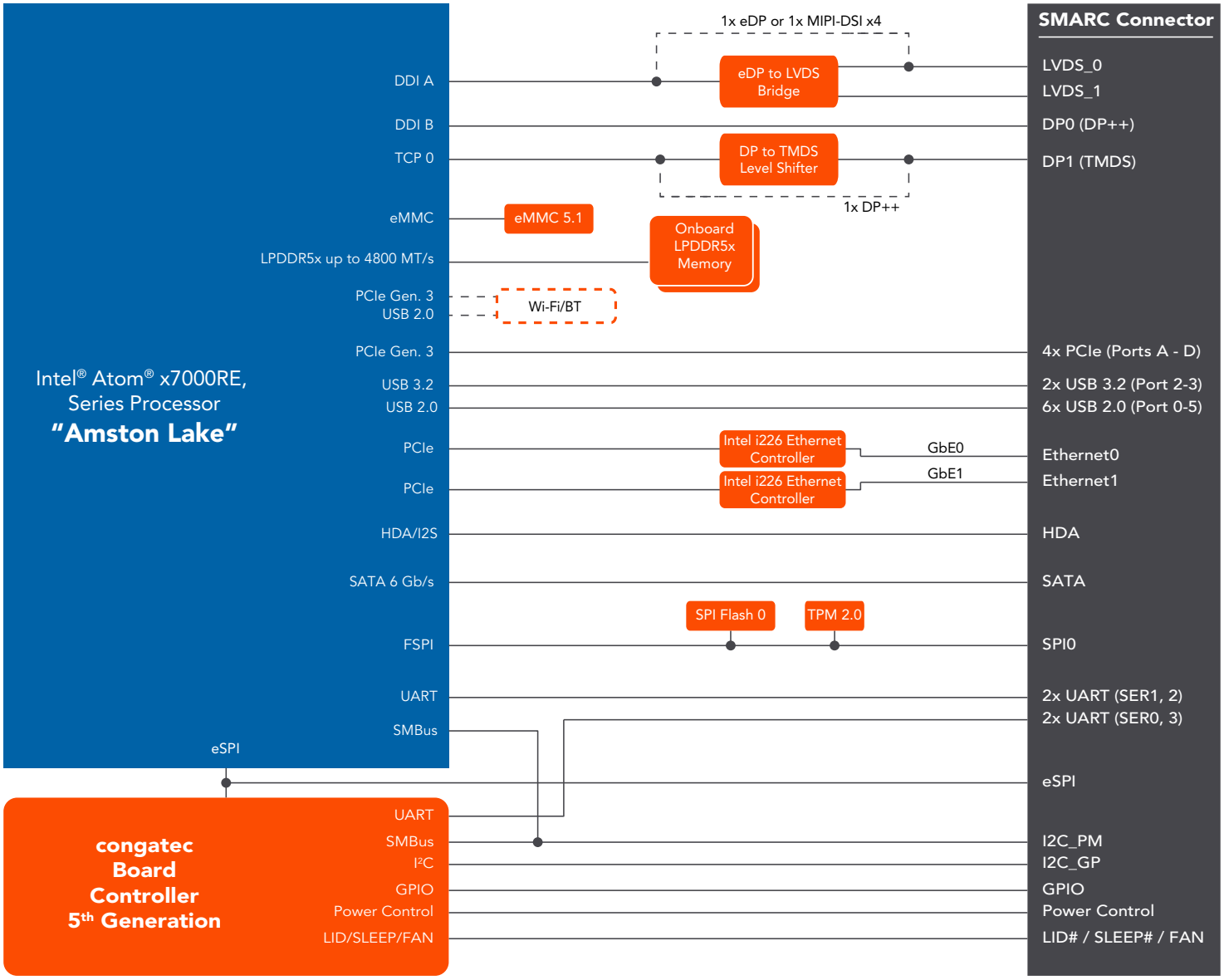
The heatpipes of congatec heatspreaders/cooling solutions are filled with water by default. For optimal cooling performance, do not store the heatspreaders/cooling solutions at temperatures below -20°C.

Caution

1. *For temperatures between -10°C and -20°C, preheat the heatpipes before operation. Optionally, the heatpipes can be filled with acetone instead. For more information, contact your local sales representative.*

2. *For optimal thermal dissipation, do not store the congatec cooling solutions for more than six months.*

3 Block Diagram



4 Cooling Solutions

congatec GmbH offers the following cooling solutions for the conga-SA8 variants. The dimensions of the cooling solutions are shown in the sub-sections. All measurements are in millimeters.

Table 9 Cooling Solution Variants

	Cooling Solution	Part No	Description
1	CSP	051450	Passive cooling with 2.7 mm bore-hole standoffs
2	HSP	051451	Heatspreader with 2.7 mm bore-hole standoff
3	CSA Adapter	050060	Active cooling solution adapter for the HSP

Note

1. *We recommend a maximum torque of 0.46 Nm for carrier board mounting screws (M.25 x 12 mm) and 0.30 Nm for module mounting screws (M.25 x 5 mm).*

2. *The gap pad material used on congatec heatspreaders may contain silicon oil that can seep out over time depending on the environmental conditions it is subjected to. For more information about this subject, contact your local congatec sales representative and request the gap pad material manufacturer's specification.*

Caution

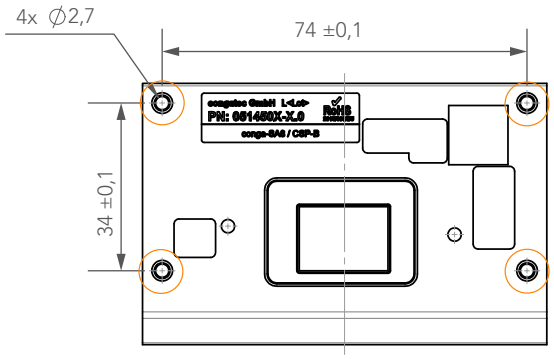
1. *The congatec heatspreaders/cooling solutions are tested only within the commercial temperature range of 0° to 60°C. Therefore, if your application that features a congatec heatspreader/cooling solution operates outside this temperature range, ensure the correct operating temperature of the module is maintained at all times. This may require additional cooling components for your final application's thermal solution.*

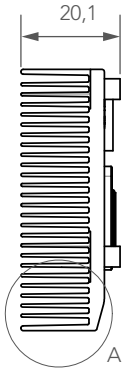
2. *For adequate heat dissipation, use the mounting holes on the cooling solution to attach it to the module. Apply thread-locking fluid on the screws if the cooling solution is used in a high shock and/or vibration environment. To prevent the standoff from stripping or cross-threading, use non-threaded carrier board standoffs to mount threaded cooling solutions.*

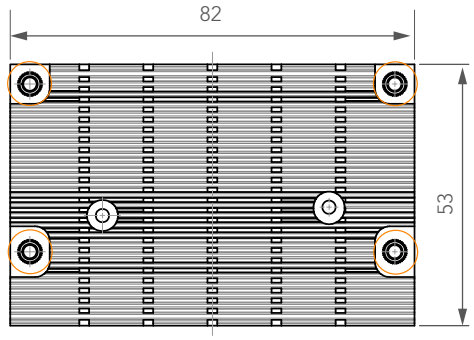
3. *For applications that require vertically-mounted cooling solution, use only coolers that secure the thermal stacks with fixing post. Without the fixing post feature, the thermal stacks may move.*

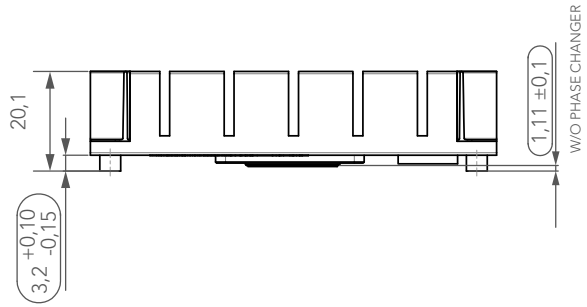
4. *Do not exceed the recommended maximum torque. Doing so may damage the module or the carrier board, or both.*

4.1 CSP Dimensions

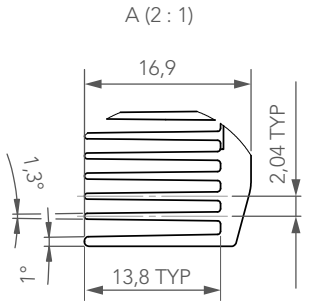


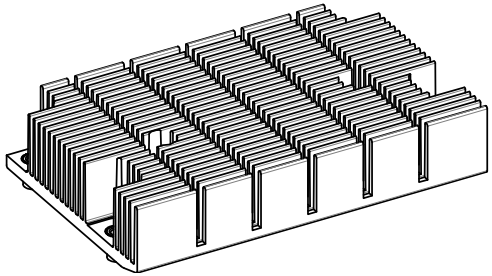


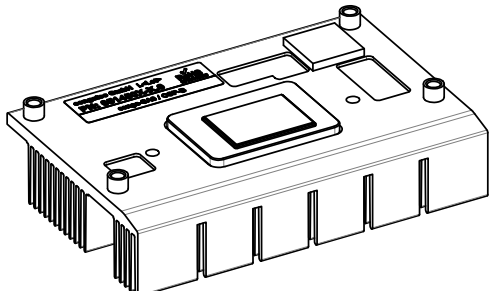




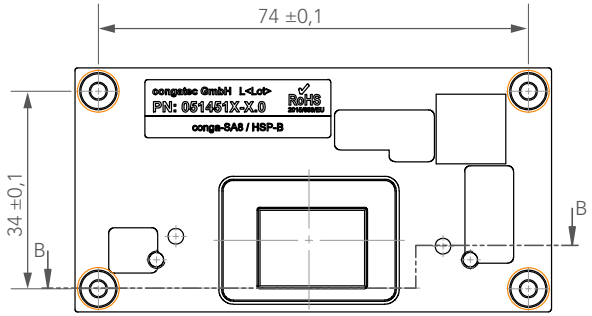
Ø 2.7 x 6 mm
non-threaded standoff
for borehole version

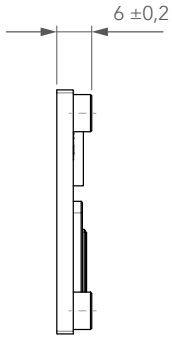


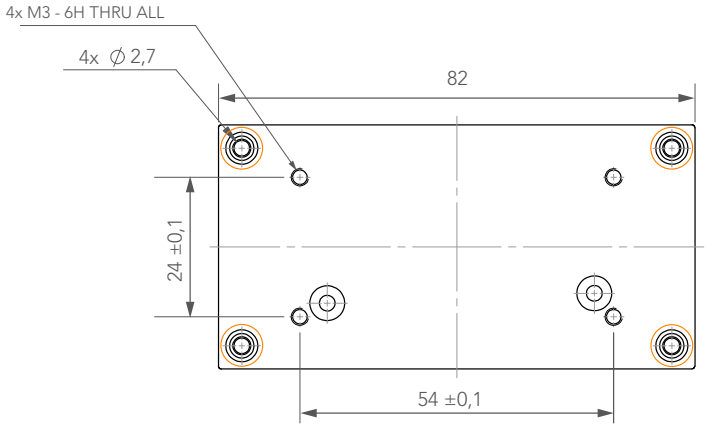


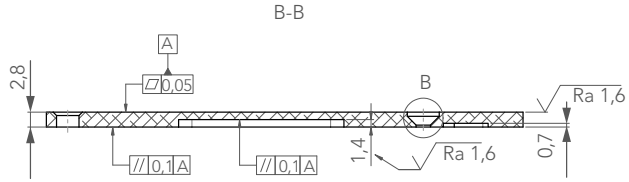


4.2 HSP Dimensions

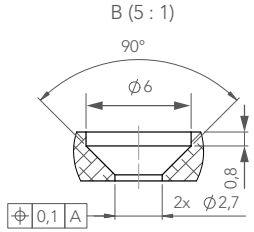


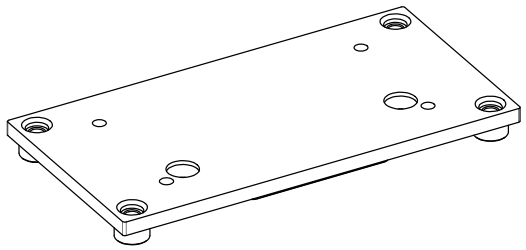


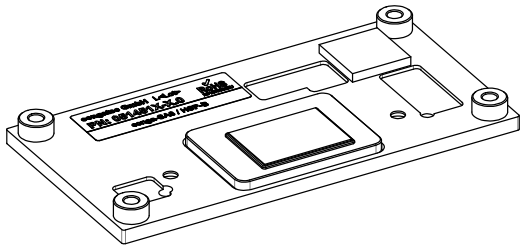




ø2.7 x 6 mm
non-threaded standoff
for borehole version







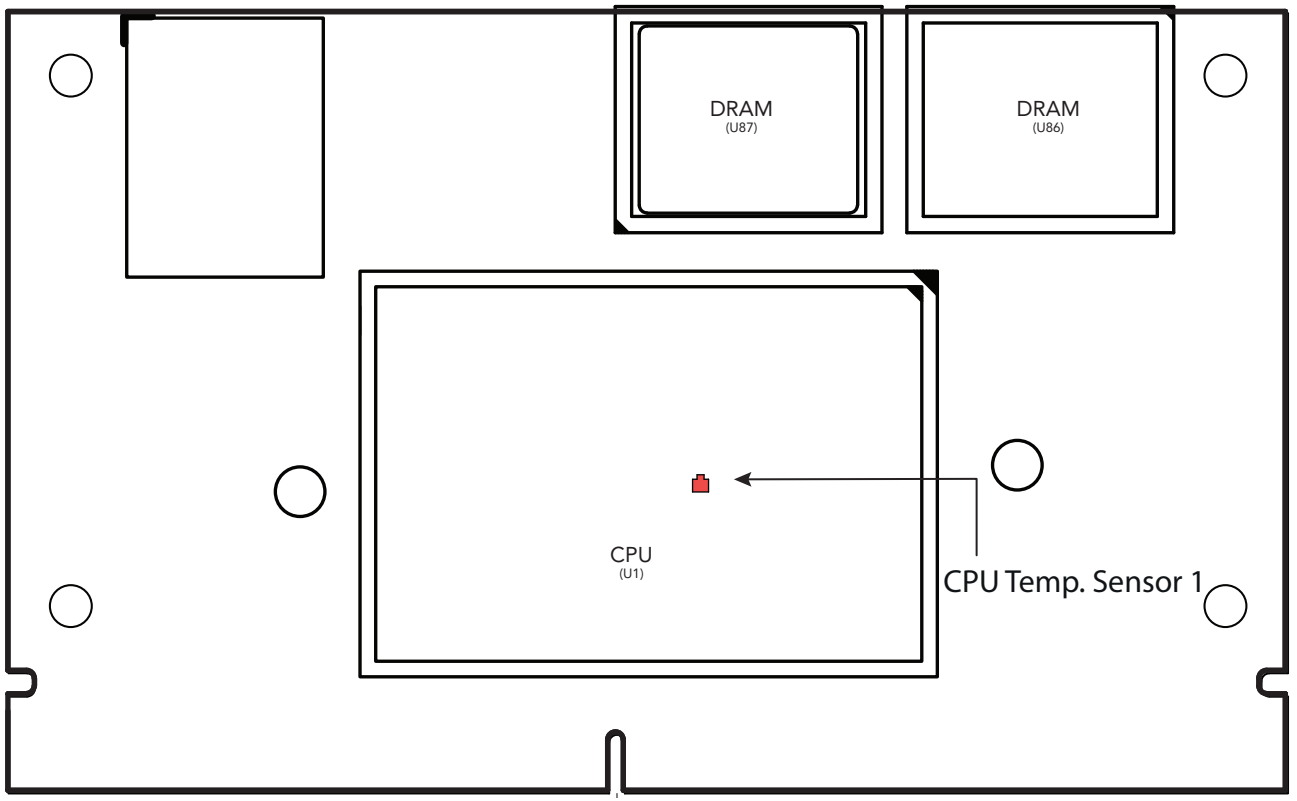
5 Temperature Sensors

The conga-SA8 features three temperature sensors—two on the top-side of the module and one sensor on the bottom-side of the module.

5.1 Top-Side Sensors

The conga-SA8 features a CPU temperature sensor on the top side of the module. The sensor is located in the CPU (U1). This sensor measures the CPU temperature and is defined in CGOS API as CGOS_TEMP_CPU.

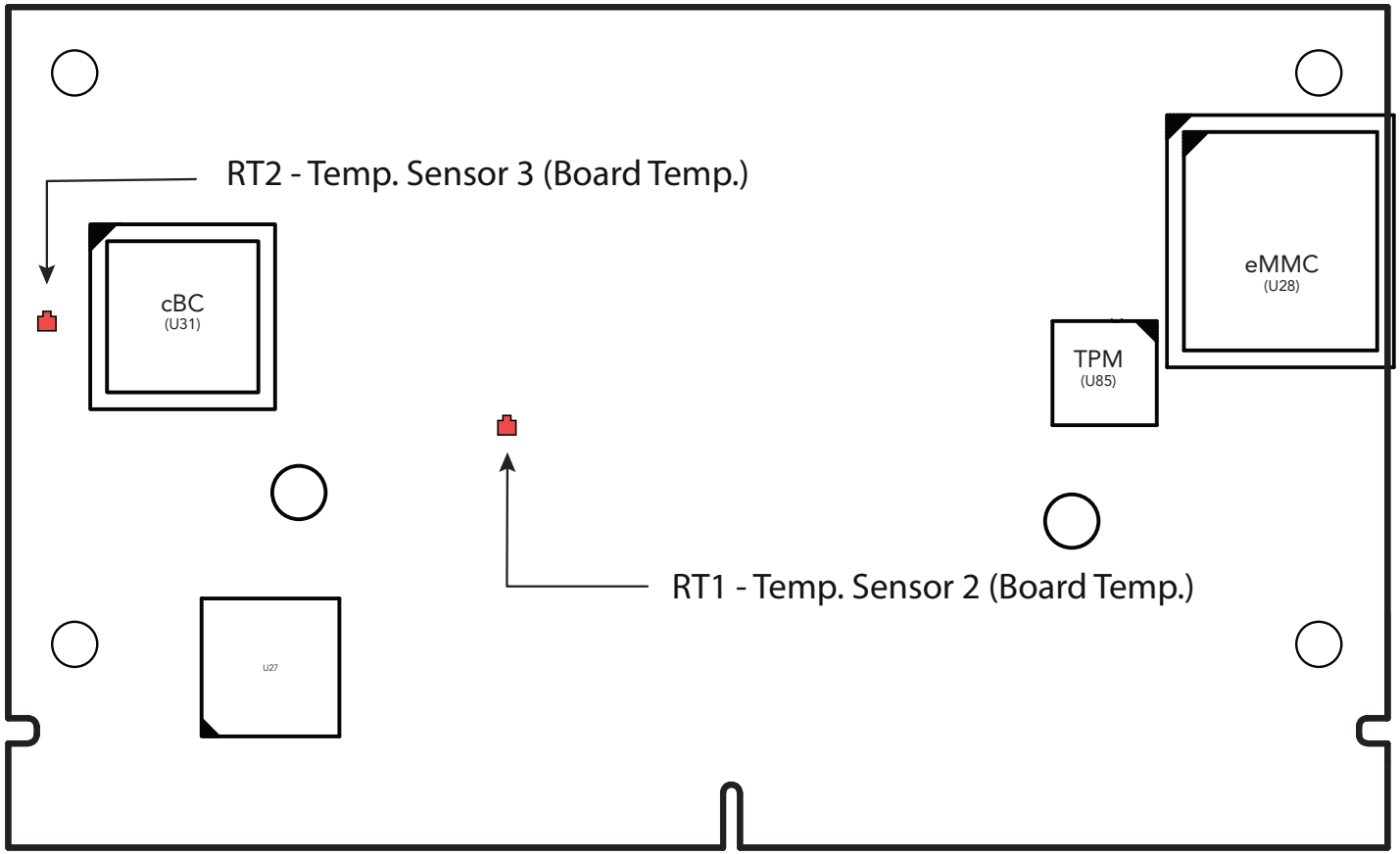
The sensor location is shown below:



5.2 Bottom-Side Sensors:

The conga-SA8 features two board temperature sensors on the bottom side of the module. The board temperature sensor RT1 measures the hot spot of the module. The sensor is defined in CGOS API as CGOS_TEMP_BOARD_ALT.

The board temperature sensor RT2 measures the cold spot of the module. The sensor is defined in CGOS API as CGOS_TEMP_BOARD. The sensor locations are shown below:



6 Connector Rows

The conga-SA8 has 314 edge fingers that mate with the MXM3 connector located on the carrier board. This connector is able to interface the signals on the conga-SA8 with the carrier board peripherals.

6.1 PCI Express™

The conga-SA8 offers up to four PCI Express™ lanes. The lanes support:

- up to 8 GT/s (Gen 3) speed
- a 4 x1 link configuration (default) [1,3]
- a 2 x2 or 1 x2 + 2 x1 link [2,3] configuration
- lane reversal

Note

1. *Requires a clock buffer on the carrier board*
2. *Possible only with a custom BIOS firmware*
3. *Variants that feature Wifi/BT modules support only three PCIe lanes.*
4. *The conga-SA8 provides PCIe_A_REFCK, PCIe_B_REFCK and PCIe_C_REFCK reference clocks to the carrier board.*

6.1.1 Possible Reference Clock Configuration

The conga-SA8 provides three PCIe reference clocks to the carrier board. The possible reference clock configuration is described below.

Table 10 PCIe Reference Clock Configuration

PCIe Lanes to Carrier Board	Possible Link Configuration			
	Default (4 x1)	Option 1 (1 x2 + 2 x1)	Option 2 (2 x2)	Option 3 (1 x4)
PCIe_A	PCIe_A_REFCK	PCIe_A_REFCK	PCIe_A_REFCK	N.A
PCIe_B	PCIe_B_REFCK			
PCIe_C	PCIe_C_REFCK	PCIe_B_REFCK	PCIe_B_REFCK	
PCIe_D	PCIe_C_REFCK via carrier buffer	PCIe_C_REFCK		

6.2 Display Interfaces

The conga-SA8 offers the following display interfaces:

- dual-channel LVDS
- native HDMI
- dual-mode DisplayPort (DP++)
- optional eDP
- optional dual-mode DisplayPort [2]

Note

1. *LVDS is not supported with this option.*
2. *Native HDMI is not supported with this option.*

The table below shows the display combination.

Table 11 Display Combination

	Display 1 (DDI0)		Display 2 (DDI1)		Display 3 (DDI2)	
	Interface	Max. Resolution	Interface	Max. Resolution	Interface	Max. Resolution
Default	LVDS	1920x1200 @ 60Hz (dual mode)	DP++	4096x2304 @ 60Hz	HDMI	4096x2160 @ 60Hz
Option 1	eDP or DSI	eDP: 1920x1080 @ 60 Hz DSI: 1920x1080 @ 60 Hz	DP++ or HDMI	4096x2304 @ 60Hz 4096x2160 @ 60Hz	DP++	4096x2304 @ 60Hz
Option 2	LVDS or eDP or DSI	LVDS: 1920x1200 @ 60Hz (dual mode) eDP: 1920x1080 @ 60 Hz DSI: 1920x1080 @ 60 Hz	DP++	4096x2304 @ 60Hz	DP++	4096x2304 @ 60Hz

Note

The resolutions in table 11 apply when multiple displays are connected.

6.2.1 LVDS

The conga-SA8 offers an LVDS interface. The interface supports the following:

- single- or dual-channel LVDS (color depths of 18 bpp or 24 bpp)
- integrated flat panel interface with clock frequency up to 112 MHz
- VESA and OpenLDI LVDS color mappings
- automatic panel detection via Embedded Panel Interface based on VESA EDID™ 1.3
- resolution up to 1920x1200 in dual LVDS bus mode

Note

1. *LVDS channel A (first channel) supports an optional eDP (assembly option).*
2. *Variants with optional eDP do not support LVDS interface*

6.2.2 HDMI

The conga-SA8 offers a native HDMI interface. The interface supports the following:

- HDMI 2.0b specification
- data rate of 5.94 GT/s
- resolutions up to 4096x2160 @ 60 Hz
- optional dual-mode DisplayPort (assembly option)

Note

Variants with optional dual-mode DisplayPort do not support native HDMI voltage levels.

6.2.3 DP ++

The conga-SA8 offers a dual-mode DisplayPort (DP++). The interface supports:

- VESA DisplayPort standard 1.4
- data rates of 5.4 GT/s without re-timer
- resolutions up to 4096x2304 @ 60 Hz

6.3 SATA

The conga-SA8 offers a SATA interface. The interface supports:

- SATA specification 3.2
- independent DMA operation
- data transfer rates up to 6.0 Gb/s
- AHCI mode using memory space

Note

SATA interface does not support legacy mode using I/O space.

6.4 Gigabit Ethernet

The conga-SA8 offers two 2.5 Gigabit Ethernet [1] interfaces via Intel i226 Ethernet controller. The interfaces support:

- full- or half-duplex operation at 10/100/1000/2500 Mb/s
- Time Sensitive Networking [2]
- Wake-on-LAN

Note

1. *The MAC address of the Intel i226 Ethernet controller is preprogrammed by default. The MAC address cannot be reprogrammed. If you require custom MAC address, contact your local sales representative.*
2. *Not supported in Windows Operating System*

6.5 USB

The conga-SA8 supports the following:

- up to six USB 2.0 ports
- up to two Superspeed receive and transmit differential pairs for SuperSpeed signaling
- USB 2.0 and 3.1 specification
- SuperSpeed, high-speed, full-speed and low-speed signaling

The possible options for USB port mapping are shown in the table below.

Table 12 Possible USB Port Mapping

	USB 2.0		USB 3.1 Gen 2/2.0	
	Host Only	Dual Role	Host Only	Dual Role
Default	3 ports	1 port	2 port	-
Option 1	4 ports	1 port	1 port	-
Option 2	5 ports	1 port	-	-
Option 3	6 ports	-	-	-

Note

For USB 3.1 Gen 2 support on your carrier board, pair USB 2.0 port 2 or 3 or both with the SuperSpeed signals.

6.6 Audio

The conga-SA8 offers a High Definition audio by default. The HDA_RST# pin which is multiplexed with GPIO4 is configured to support HD audio by default.

Note

The HDA interface will not function if you configure the multiplexed pin for GPIO functionality.

6.7 UART

The conga-SA8 provides four standard 16C550 UART ports:

- SER1 and SER2 via the SoC [1]
- SER0 and SER3 via the congatec board controller

Ports SER0 and SER2 support flow control while ports SER1 and SER3 ports do not support flow control. The interfaces support up to 115200 baud rate.

Note

1. *DMA transactions are not supported in legacy mode*

6.8 GPIO

The conga-SA8 offers up to 14 GPIOs—11 GPIOs by default and three GPIOs through multiplexed pins P112–P114. The GPIOs are controlled by the congatec Board controller.

If you configure the multiplexed pins (P112–P114) for GPIO functionality, their alternate functions (HDA audio, fan control) will not be available. See table 31 "GPIO Signal Description" for more information.

6.9 SPI

The conga-SA8 offers two SPI interfaces:

- an eSPI for general purpose eSPI devices
- SPI0 for on-module or carrier board flash device

Note

The conga-SA8 supports only one eSPI chip select signal on the SMARC connector.

6.10 I2C

The conga-SA8 offers two I2C interfaces:

- general purpose I2C
- power management I2C

These interfaces are implemented through the congatec board controller and accessed through the congatec CGOS driver and API. The controller provides a fast-mode multi-master I2C bus that has maximum I2C bandwidth.

Table 13 Reserved I2C Addresses

Bus Type	Slave Address Bits [7:1]	Slave Address Bits [7:0]	Device	Comment
I2C_PM	0x20	0x40	U81: Voltage Regulator	
I2C_PM	0x60	0xC0	U27: DP-LVDS bridge	
I2C_PM	0x5E	0xBC	U25: HDMI Level Shifter and Retimer	
I2C_PM	0x6D	0xDA	U111: PCI Clock Buffer	
I2C_PM, I2C_GP	0x0A	0x14	congatec Board Controller	Reserved for Battery System Manager Address
I2C_PM, I2C_GP	0x0B	0x16	congatec Board Controller	Reserved for Smart Battery System Management Bus (SMBus)

6.11 Power Control

The conga-SA8 operates only with 5 V input voltage. Its power-up sequence is described below:

1. The 5 V input voltage (VDD_IN) supplied to the carrier board powers the conga-SA8.
2. The conga-SA8 enables its power circuits if the VIN_PWR_BAD# signal is high.
3. Depending on the carrier board design and configuration, the conga-SA8 detects a power button event (PWRBTN#) if implemented.
4. The conga-SA8 enables the carrier board power by asserting CARRIER_PWR_ON (PMC_RSMRST#) and CARRIER_STBY# (SUS_S3#).
5. The conga-SA8 releases the RESET_OUT# and starts the boot process.

The power control signals VIN_PWR_BAD#, CARRIER_PWR_ON, CARRIER_STBY#, RESET_IN#, RESET_OUT# and POWER_BTN# are described below:

VIN_PWR_BAD#

If VIN_PWR_BAD# signal (pin S150) is low, it indicates that the input voltage to the conga-SA8 is either not ready or out of the specified range.

Note

Carrier board hardware should drive this signal low until the input power is up and stable. Releasing VIN_PWR_BAD# too early can cause numerous boot up problems.

CARRIER_PWR_ON

The CARRIER_PWR_ON signal (pin S154) is an active-high output signal. The signal is connected to the PMC_RSMRST# (resume reset) input signal of the SoC. The module asserts the CARRIER_PWR_ON signal when all its power supplies are up, and subsequently enables the carrier board power supplies.

The PMC_RSMRST# signal (CARRIER_PWR_ON) is active in SUS_S5 or SUS_S3 power states.

Note

You can assert the CARRIER_PWR_ON signal with SUS_S5 pin, similar to the operation on the conga-SA8. This approach however, requires a customized conga-SA8 (assembly option)

CARRIER_STBY#

The CARRIER_STBY# signal (pin S153) is an active-low output that can be used to indicate that the conga-SA8 is going into suspend state, where only power management functions and system memory are powered.

The CARRIER_STBY# signal can also be used to disable the carrier board power that is not required during standby.

RESET_IN#

The RESET_IN# signal (pin P127) is an active-low, open-drain input signal from the carrier board to the module. The signal may be used to force the module to either stay in reset during boot up or to reset the module after boot up.

Note

The RESET_IN# signal has a pull-up resistor on the conga-SA8 module.

RESET_OUT#

The RESET_OUT# signal (pin P126) is an active-low output signal from the module. The module asserts this signal during the power-up sequencing to allow the carrier board power circuits to come up. The module deasserts this signal to begin the boot-up process.

POWER_BTN#

The POWER_BTN# (pin P128) is an active-low open drain power button input from the carrier board. This power button signal is used to wake the system up from the S5 state (soft off) or shut the system down when it is in an active state.

Power Supply Implementation Guidelines

The 5 V input power is the operational power source for the conga-SA8. Other required voltages are generated internally on the module via onboard voltage regulators.

Note

When designing a power supply for a conga-SA8 application, be aware that the system may malfunction when a 5V power supply that produces non-monotonic voltage is used to power the system up. Though this problem is rare, it has been observed in some mobile power supply applications.

The problem occurs because some internal circuits on the module (e.g. clock-generator chips) generate their own reset signals when the supply voltage exceeds a certain voltage threshold. A voltage dip after passing this threshold may lead to these circuits becoming confused, thereby resulting in a malfunction.

To ensure this problem does not occur, observe the power supply rise waveform through an oscilloscope during the power supply qualification phase. This will help to determine if the rise is indeed monotonic and does not have any dips. For more information, see the "Power Supply Design Guide for Desktop Platform Form Factors" document at www.intel.com.

6.11.1 Inrush Current

The inrush current of the conga-SA8 is listed below.

Table 14 Inrush Current

Power Rail	Current [A]	Slew Rate [kV/s]	Voltage Ramp [ms]	Comment
VDD_IN	TBD	TBD	TBD	Typical scenario
VDD_RTC	TBD	TBD	TBD	

Power Rail	Current [A]	Slew Rate [kV/s]	Voltage Ramp [ms]	Comment
VDD_IN	TBD	TBD	TBD	Worst-case scenario
VDD_RTC	TBD	TBD	TBD	

Note

Ensure the power supply and decoupling capacitors on the carrier board are adequate for proper power sequencing.

7 Additional Features

7.1 Integrated Real-Time Hypervisor

The RTS Hypervisor is integrated into the congatec firmware on the conga-SA8 by default. With the RTS Hypervisor, you can consolidate functionality that previously required multiple dedicated systems on a single x86 hardware platform.

The integrated RTS Hypervisor offers a 30-day free evaluation license. The 30-day evaluation starts when the customer receives the x86-based modules. To access the full package, contact congatec Sales team via the online "Request Quote" button for your particular product at **https://www.congatec.com/en/products/hypervisor-products/**.

To activate the RTS Hypervisor, change the "Boot Device" in the BIOS setup menu to "Integrated RTS Hypervisor".

1. Press F2 or DEL during POST to enter the BIOS setup menu.
2. Go to the Boot tab to enter the Boot setup screen.
3. Select "Integrated RTS Hypervisor" as "1st Boot Device".
4. Go to the Save & Exit tab and select "Save Changes and Exit".

For more information about the integrated Hypervisor, see the congatec Application Note AN56_Hypervisor_on_Module.pdf on the congatec website at https://www.congatec.com/en/support/application-notes/.

Note

1. *The configuration steps and the BIOS setup menu above are valid for "Type Based Boot Priority". For "UEFI Boot Priority", the BIOS setup menu may differ.*
2. *The Real-Time Operating System images, driver packages for the General-Purpose Operating System and the installation procedures for the Operating Systems are available for download under the "Technical information" section, in the restricted area of congatec website at www.congatec.com/login. If you require login access, contact your local sales representative.*

7.2 Optional Onboard Interface

The conga-SA8 offers an optional Wi-fi/Blueetooth module (assembly option).

7.3 eMMC

The conga-SA8 offers an eMMC 5.1 flash onboard. Changes to the onboard eMMC may occur during the lifespan of the module in order to keep up with the rapidly changing eMMC technology.

The performance of the newer eMMC may vary depending on the eMMC technology.

Note

For adequate operation of the eMMC, ensure that at least 15 % of the eMMC storage is reserved for vendor-specific functions.

7.4 TPM

The conga-SA8 offers a discrete 2.0 (Infineon SLB9672 FW15) by default.

7.5 congatec Board Controller (cBC)

The conga-SA8 is equipped with Microchip microcontroller. This onboard microcontroller plays an important role for most of the congatec embedded/industrial PC features. It fully isolates some of the embedded features such as system monitoring or the I²C bus from the x86 core architecture. With this isolation, the performance and reliability of the embedded feature is increased even when the x86 processor is in a low power mode. It also ensures that the congatec embedded feature set is fully compatible amongst all congatec modules.

The board controller supports the following features:

- Board information
- Watchdog
- Power loss control
- General Purpose Input/Output (see section 6.8 “GPIO”)
- I2C bus (see section 6.10 “I2C”)
- UART (see section 6.7 “UART”)
- Fan control
- Enhanced soft-off state (S5e)

7.5.1 Board Information

The cBC provides a rich data-set of manufacturing and board information such as serial number, EAN number, hardware and firmware revisions, and so on. It also keeps track of dynamically-changing data like runtime meter and boot counter.

7.5.2 Watchdog

The conga-SA8 is equipped with a multi stage watchdog solution that is triggered by software. The conga-SA8 does not support external hardware triggering because the SMARC Specification does not support external hardware triggering of the watchdog. For more information, see the application note AN3_Watchdog.pdf on the congatec GmbH website at www.congatec.com.

Note

The conga-SA8 module does not support the watchdog NMI mode.

7.5.3 Power Loss Control

The cBC provides the power loss control feature. The power loss control feature determines the behaviour of the system after an AC power loss occurs. This feature applies to systems with ATX-style power supplies which support standby power rail.

The term "power loss" implies that all power sources, including the standby power are lost (G3 state). Once power loss (transition to G3) or shutdown (transition to S5) occurs, the board controller continuously monitors the standby power rail. If the standby voltage remains stable for 30 seconds, the cBC assumes the system was switched off properly. If the standby voltage is no longer detected within 30 seconds, the module considers this an AC power loss condition.

The power loss control feature has three different modes that define how the system responds when standby power is restored after a power loss occurs. The modes are:.

- Turn On: The system is turned on after a power loss condition
- Remain Off: The system is kept off after a power loss condition
- Last State: The board controller restores the last state of the system before the power loss condition

Note

1. *If a power loss condition occurs within 30 seconds after a regular shutdown, the cBC may incorrectly set the last state to "ON".*
2. *The settings for power loss control have no effect on systems with AT-style power supplies which do not support standby power rail.*
3. *The 30 seconds monitoring cycle applies only to the "Last State" power loss control mode.*

7.5.4 Fan Control

The conga-SA8 offers FAN_PWMOUT output signal and FAN_TACHOIN input signal for fan control, thereby improving system management. The FAN_PWMOUT signal adjusts the rotational speed of the fan without changing the fan's input voltage while the FAN_TACHOIN signal provides the ability to monitor the system's fan RPMs (revolutions per minute).

The FAN_TACHOIN signal must receive two pulses per revolution in order to produce an accurate reading. For this reason, a two-pulse per revolution fan or similar hardware solution is recommended.

Note

1. *A four wire fan must be used to generate the correct speed readout. For the correct fan control (PWMOUT, TACHIN) implementation, see the SMARC Design Guide Specification.*

2. *The PWMOUT and TACHIN pins are shared with GPIO 5 and 6 respectively. The conga-SA8 does not support fan control if these pins are used for GPIO functionality.*

7.5.5 Enhanced Soft-Off State

The conga-SA8 supports an enhanced Soft-Off state (S5e)—a congatec proprietary low-power Soft-Off state. In this state, the CPU module switches off almost all the onboard logic in order to reduce the power consumption to absolute minimum (between 0.05 mA and 0.09 mA).

Refer to congatec application note AN36_Enhanced_Soft_Off.pdf for detailed description of the S5e state.

7.6 OEM BIOS Customization

The conga-SA8 is equipped with congatec Embedded BIOS, which is based on American Megatrends Inc. Aptio UEFI firmware. The congatec Embedded BIOS allows system designers to modify the BIOS. For more information about customizing the congatec Embedded BIOS, refer to the congatec System Utility user's guide CGUTLm1x.pdf on the congatec website at www.congatec.com or contact technical support.

The customizable features are described below:

7.6.1 OEM Default Settings

This feature allows system designers to create and store their own BIOS default configuration. Customized BIOS development by congatec for OEM default settings is no longer necessary because customers can easily perform this configuration by themselves using the congatec system utility CGUTIL. See congatec application note AN8_Create_OEM_Default_Map.pdf on the congatec website for details on how to add OEM default settings to the congatec Embedded BIOS.

7.6.2 OEM Boot Logo

This feature allows system designers to replace the standard text output displayed during POST with their own BIOS boot logo. Customized BIOS development by congatec for OEM Boot Logo is no longer necessary because customers can easily perform this configuration by themselves using the congatec system utility CGUTIL. See congatec application note AN8_Create_And_Add_Bootlogo.pdf on the congatec website for details on how to add OEM boot logo to the congatec Embedded BIOS.

7.6.3 OEM POST Logo

This feature allows system designers to replace the congatec POST logo displayed in the upper left corner of the screen during BIOS POST with their own BIOS POST logo. Use the congatec system utility CGUTIL 1.5.4 or later to replace/add the OEM POST logo.

7.6.4 OEM DXE Driver

This feature allows designers to add their own UEFI DXE driver to the congatec embedded BIOS. Contact congatec technical support for more information on how to add an OEM DXE driver.

7.7 congatec Battery Management Interface

To facilitate the development of battery powered mobile systems based on embedded modules, congatec GmbH defined an interface for the exchange of data between a CPU module (using an ACPI operating system) and a Smart Battery system. A system developed according to the congatec Battery Management Interface Specification can provide the battery management functions supported by an ACPI capable operating system (e.g. charge state of the battery, information about the battery, alarms/events for certain battery states, ...) without the need for any additional modifications to the system BIOS.

In addition to the ACPI-Compliant Control Method Battery mentioned above, the latest versions of the conga-SA8 BIOS and board controller firmware also support LTC1760 battery manager from Linear Technology and a battery only solution (no charger). All three battery solutions are supported on the I2C bus and the SMBus. This gives the system designer more flexibility when choosing the appropriate battery sub-system.

For more information about the supported Battery Management Interface, contact your local sales representative.

7.8 API Support (CGOS)

To benefit from the above mentioned non-industry standard feature set, congatec provides an API that allows application software developers to easily integrate all these features into their code. The CGOS API (congatec Operating System Application Programming Interface) is the congatec proprietary API that is available for all commonly used Operating Systems such as Win32, Win64, Win CE, Linux.

The architecture of the CGOS API driver provides the ability to write application software that runs unmodified on all congatec CPU modules. All the hardware related code is contained within the congatec embedded BIOS on the module. See section 1.1 of the CGOS API software developers guide, which is available on the congatec website.

7.9 congatec System Sensors

The conga-SA8 offers the following sensors and monitors:

- temperature sensors
  - CPU temperature based on CPU Digital Thermal Sensor
  - Bottom-side board temperature sensor (RT2) located at the edge of the board, near the congatec Board Controller
  - Bottom-side board temperature sensor (RT1) located near the CPU hotspot
- voltage sensors
  - 5V standard voltage sensor
- current sensor
- fan monitor

The sensors and monitors are accessible through CGOS interface, and also visible via the “Health Monitor”submenu in the BIOS Setup.

7.10 Suspend to Ram

The Suspend to RAM feature is available on the conga-SA8.

8 conga Tech Notes

8.1 Intel® SoC Features

The Intel AlderLake and Anston Lake processors are 64-bit, multi-core processors built on 10 nanometer process technology. Some of the features supported by the processors are:

- Intel® Virtualization Technology (Intel® VT-x)
- Intel® Virtualization Technology for Directed I/O (Intel® VT-d)
- Intel® APIC Virtualization Technology (Intel® APICv)
- Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)
- Intel® Advanced Vector Extensions 2 (Intel® AVX2)
- Intel GNA 3.0 (GMM and Neural Network Accelerator)
- Intel® Supervisor Mode Access Protection (SMAP)
- Intel® Supervisor Mode Execution Protection (SMEP)
- Intel® Boot Guard
- User Mode Instruction Prevention (UMIP)
- Thermal management support via Intel® Adaptive Thermal Monitor
- Intel® SpeedStep® Technology
- Intel® Turbo Boot Technology 2.0
- Intel® Speed Shift Technology
- Intel® 64 Architecture
- Vector Neural Network Instructions
- Power Aware Interrupt Routing
- Uses 10 nm process technology

Note

Intel® Hyper-Threading technology is not supported (four cores execute four threads)

8.2 Intel® Virtualization Technology

Intel® Virtualization Technology (Intel® VT) makes a single system appear as multiple independent systems to software. With this technology, multiple, independent operating systems can run simultaneously on a single system. The technology components support virtualization of platforms based on Intel architecture microprocessors and chipsets. Intel® Virtualization Technology for IA-32, Intel® 64 and Intel® Architecture (Intel® VT-x) added hardware support in the processor to improve the virtualization performance and robustness.

RTS Real-Time Hypervisor supports Intel® VT and is verified on all current congatec x86 hardware.

Note

congatec supports RTS Hypervisor.

8.3 Intel® SpeedStep® Technology (EIST)

Intel® processors found on the conga-SA8 run at different voltage/frequency states (performance states), which is referred to as Enhanced Intel® SpeedStep® Technology (EIST). Operating systems that support performance control take advantage of microprocessors that use several different performance states to efficiently operate the processor when it is not being fully used. The operating system will determine the necessary performance state that the processor should run at so that the optimal balance between performance and power consumption can be achieved during runtime.

The Windows family of operating systems links its processor performance control policy to the power scheme setting. You must ensure that the power scheme setting you choose has the ability to support Enhanced Intel® SpeedStep® technology.

The Intel® SoC supports Intel Speed Shift, an energy efficient method for frequency control. This feature is also referred to as Hardware-controlled Performance States (HWP). The feature is a hardware implementation of the ACPI defined Collaborative Processor Performance Control (CPPC2) and is supported by newer operating systems (Win 8.1 or newer).

With this feature enabled, the processor autonomously selects performance states based on workload demand and thermal limits while also considering information provided by the Operating System (for example, the performance limits and workload history).

8.4 Intel® Turbo Boost Technology

Intel® Turbo Boost Technology allows processor cores to run faster than the base operating frequency if it is operating below power, current, and temperature specification limits. Intel® Turbo Boost Technology is activated when the Operating System requests the highest processor performance state. The maximum frequency of Intel® Turbo Boost Technology depends on the number of active cores. The amount of time the processor spends in the Intel Turbo Boost Technology state depends on the workload and operating environment.

Any of the following can set the upper limit of Intel® Turbo Boost Technology on a given workload:

- Number of active cores
- Estimated current consumption
- Estimated power consumption
- Processor temperature

When the processor is operating below these limits and the user's workload demands additional performance, the processor frequency dynamically increases by 100 MHz on short and regular intervals until the upper limit is met or the maximum possible upside for the number of active cores is reached.

For more information about Intel® Turbo Boost Technology, visit the Intel® website.

Note

1. *For real-time sensitive applications, disable EIST and Turbo Mode in the BIOS setup to ensure a more deterministic performance.*
2. *Disable Turbo mode for industrial use condition.*

8.5 Thermal Management

ACPI is responsible for allowing the operating system to play an important part in the system's thermal management. This results in the operating system having the ability to take control of the operating environment by implementing cooling decisions according to the demands put on the CPU by the application.

The conga-SA8 ACPI thermal solution offers two different cooling policies.

- **Passive Cooling**

When the temperature in the thermal zone must be reduced, the operating system can decrease the power consumption of the processor by throttling the processor clock. One of the advantages of this cooling policy is that passive cooling devices (in this case the processor) do not produce any noise. Use the "passive cooling trip point" setup node in the BIOS setup program to determine the temperature threshold that the operating system will use to start or stop the passive cooling procedure.

- **Critical Trip Point**

If the temperature in the thermal zone reaches a critical point then the operating system will perform a system shut down in an orderly fashion in order to ensure that there is no damage done to the system as result of high temperatures. Use the "critical trip point" setup node in the BIOS setup program to determine the temperature threshold that the operating system will use to shut down the system.

Note

The end user must determine the cooling preferences for the system by using the setup nodes in the BIOS setup program to establish the appropriate trip points.

If passive cooling is activated and the processor temperature is above the trip point the processor clock is throttled. See section 12 of the ACPI Specification 2.0 C for more information about passive cooling.

8.6 ACPI Suspend Modes and Resume Events

The conga-SA8 BIOS supports S3 (Suspend to RAM). The BIOS does not support S4 (Suspend to Disk).

Table 15 Wake Events

The table below lists the events that wake the system from S3.

Wake Event	Conditions or remarks
Power Button	Wakes unconditionally from S3
Onboard LAN Event	Device driver must be configured for Wake On LAN support
SMBALERT#	Wakes unconditionally from S3
PCI Express WAKE#	Wakes unconditionally from S3
WAKE#	Wakes unconditionally from S3
USB Mouse/Keyboard Event	When standby mode is set to S3, the USB hardware must be powered by the standby power source. • Set "USB Device Wakeup" to "Enabled" in the ACPI setup menu (if the feature is available in the BIOS setup menu) • Expand "Keyboard" or "Mice and other pointing devices" in Device Manager • Right-click keyboard or mouse device and then click "Properties" • Click "Power Management" tab and check "Allow this device to wake the computer'
RTC Alarm	In the power setup menu, activate and configure "Resume On RTC Alarm"
Watchdog Power Button Event	Wakes unconditionally from S3

9 Signal Descriptions and Pinout Tables

The following section describes the signals on SMARC® module's edge fingers. The pinout of the module complies with SMARC Specification 2.1. The table below describes the terminology used in this section. The PU/PD column indicates if a pull-up or pull-down resistor has been used. If the field entry area in this column for the signal is empty, then no pull-up or pull-down resistor has been implemented. The "#" symbol at the end of the signal name indicates that the active or asserted state occurs when the signal is at a low voltage level.

Note

Not all the signals described in this section are available on all conga-SA8 variants. Use the part number of the module and refer to the tables in section 1.2 "conga-SA8 Options Information" to determine the options available on the module.

Table 16 Signal Tables Terminology Descriptions

Term	Description
I	Input to the module
O	Output from the module
O OD	Open drain output from the module
I OD	Open drain input to the module, with pull-up on module
OD	Open drain
I/O	Bi-directional Input/Output Pin
PU/PD	Pull-up or pull-down resistor on the module
PU(i)/PD(i)	Pull-up or pull-down resistor internal to the SoC or transceiver
VDD_IN	Signal may be exposed to module input voltage range (4.75 to 5.25V)
CMOS	Logic input or output with 3.3 V signal level
GBe MDI	Differential analog signaling for Gigabit Media Dependent Interface
LVDS DP	LVDS signaling for DisplayPort devices
LVDS D-PHY	LVDS signaling for MIPI CSI-2 camera and DSI display interfaces
LVDS LCD	LVDS signaling for LVDS LCD displays
LVDS PCIE	LVDS signaling for PCIe interfaces
LVDS SATA	LVDS signaling for SATA interfaces
TMDS	LVDS signaling for HDMI display interfaces
USB	DC coupled differential signaling for traditional (non-Superspeed) USB signals
USB SS	LVDS signaling for SuperSpeed USB signals
PCIE	PCI Express differential pair signals. In compliance with the PCI Express Base Specification 2.0
USB VBUS 5V	5V tolerant input for USB VBUS detection

Table 17 SMARC Edge Finger Pinout

P-PIN	Primary (Top) Side	S-Pin	Secondary (Bottom) Side
		S1	CSI1_TX+ / I2C_CAM1_CK [1]
P1	SMB_ALERT#	S2	CSI1_TX- / I2C_CAM1_DAT [1]
P2	GND	S3	GND
P3	CSI1_CK+ [1]	S4	RSVD [2]
P4	CSI1_CK- [1]	S5	CSI0_TX+ / I2C_CAM0_CK [1]
P5	GBE1_SDP	S6	CAM_MCK [1]
P6	GBE0_SDP	S7	CSI0_TX- / I2C_CAM0_DAT [1]
P7	CSI1_RX0+ [1]	S8	CSI0_CK+ [1]
P8	CSI1_RX0- [1]	S9	CSI0_CK- [1]
P9	GND	S10	GND
P10	CSI1_RX1+ [1]	S11	CSI0_RX0+ [1]
P11	CSI1_RX1- [1]	S12	CSI0_RX0- [1]
P12	GND	S13	GND
P13	CSI1_RX2+ [1]	S14	CSI0_RX1+ [1]
P14	CSI1_RX2- [1]	S15	CSI0_RX1- [1]
P15	GND	S16	GND
P16	CSI1_RX3+ [1]	S17	GBE1_MDI0+
P17	CSI1_RX3- [1]	S18	GBE1_MDI0-
P18	GND	S19	GBE1_LINK100#
P19	GBE0_MDI3-	S20	GBE1_MDI1+
P20	GBE0_MDI3+	S21	GBE1_MDI1-
P21	GBE0_LINK100#	S22	GBE1_LINK1000#
P22	GBE0_LINK1000#	S23	GBE1_MDI2+
P23	GBE0_MDI2-	S24	GBE1_MDI2-
P24	GBE0_MDI2+	S25	GND
P25	GBE0_LINK_ACT#	S26	GBE1_MDI3+
P26	GBE0_MDI1-	S27	GBE1_MDI3-
P27	GBE0_MDI1+	S28	GBE1_CTREF [2]
P28	GBE0_CTREF [2]	S29	PCIE_D_TX+
P29	GBE0_MDI0-	S30	PCIE_D_TX-
P30	GBE0_MDI0+	S31	GBE1_LINK_ACT#
P31	SPI0_CS1#	S32	PCIE_D_RX+

P-PIN	Primary (Top) Side	S-Pin	Secondary (Bottom) Side
P32	GND	S33	PCIE_D_RX-
P33	SDIO_WP [2]	S34	GND
P34	SDIO_CMD [2]	S35	USB4+
P35	SDIO_CD# [2]	S36	USB4-
P36	SDIO_CK [2]	S37	USB3_VBUS_DET [1]
P37	SDIO_PWR_EN [2]	S38	AUDIO_MCK [3]
P38	GND	S39	I2S0_LRCK [3]
P39	SDIO_D0 [2]	S40	I2S0_SDOUT [3]
P40	SDIO_D1 [2]	S41	I2S0_SDIN [3]
P41	SDIO_D2 [2]	S42	I2S0_CK [3]
P42	SDIO_D3 [2]	S43	ESPI_ALERT0#
P43	SPI0_CS0#	S44	ESPI_ALERT1#
P44	SPI0_CK	S45	MDIO_CLK [2]
P45	SPI0_DIN	S46	MDIO_DAT [2]
P46	SPI0_DO	S47	GND
P47	GND	S48	I2C_GP_CK
P48	SATA_TX+	S49	I2C_GP_DAT
P49	SATA_TX-	S50	HDA_SYNC
P50	GND	S51	HDA_SDO
P51	SATA_RX+	S52	HDA_SDI
P52	SATA_RX-	S53	HDA_CK
P53	GND	S54	SATA_ACT#
P54	ESPI_CS0#	S55	USB5_EN_OC#
P55	ESPI_CS1#	S56	ESPI_IO_2
P56	ESPI_CK	S57	ESPI_IO_3
P57	ESPI_IO_1	S58	ESPI_RESET#
P58	ESPI_IO_0	S59	USB5+
P59	GND	S60	USB5-
P60	USB0+	S61	GND
P61	USB0-	S62	USB3_SSTX+
P62	USB0_EN_OC#	S63	USB3_SSTX-
P63	USB0_VBUS_DET	S64	GND
P64	USB0_OTG_ID	S65	USB3_SSRX+
P65	USB1+	S66	USB3_SSRX-

P-PIN	Primary (Top) Side	S-Pin	Secondary (Bottom) Side
P66	USB1-	S67	GND
P67	USB1_EN_OC#	S68	USB3+
P68	GND	S69	USB3-
P69	USB2+	S70	GND
P70	USB2-	S71	USB2_SSTX+
P71	USB2_EN_OC#	S72	USB2_SSTX-
P72	RSVD [2]	S73	GND
P73	RSVD [2]	S74	USB2_SSRX+
P74	USB3_EN_OC#	S75	USB2_SSRX-
	Key		Key
P75	PCIE_A_RST#	S76	PCIE_B_RST#
P76	USB4_EN_OC#	S77	PCIE_C_RST#
P77	PCIE_B_CKREQ#	S78	PCIE_C_RX+
P78	PCIE_A_CKREQ#	S79	PCIE_C_RX-
P79	GND	S80	GND
P80	PCIE_C_REFCK+	S81	PCIE_C_TX+
P81	PCIE_C_REFCK-	S82	PCIE_C_TX-
P82	GND	S83	GND
P83	PCIE_A_REFCK+	S84	PCIE_B_REFCK+
P84	PCIE_A_REFCK-	S85	PCIE_B_REFCK-
P85	GND	S86	GND
P86	PCIE_A_RX+	S87	PCIE_B_RX+
P87	PCIE_A_RX-	S88	PCIE_B_RX-
P88	GND	S89	GND
P89	PCIE_A_TX+	S90	PCIE_B_TX+
P90	PCIE_A_TX-	S91	PCIE_B_TX-
P91	GND	S92	GND
P92	HDMI_D2+ / DP1_LANE0+	S93	DP0_LANE0+
P93	HDMI_D2- / DP1_LANE0-	S94	DP0_LANE0-
P94	GND	S95	DP0_AUX_SEL
P95	HDMI_D1+ / DP1_LANE1+	S96	DP0_LANE1+
P96	HDMI_D1- / DP1_LANE1-	S97	DP0_LANE1-

P-PIN	Primary (Top) Side	S-Pin	Secondary (Bottom) Side
P97	GND	S98	DP0_HPD
P98	HDMI_D0+ / DP1_LANE2+	S99	DP0_LANE2+
P99	HDMI_D0- / DP1_LANE2-	S100	DP0_LANE2-
P100	GND	S101	GND
P101	HDMI_CK+ / DP1_LANE3+	S102	DP0_LANE3+
P102	HDMI_CK- / DP1_LANE3-	S103	DP0_LANE3-
P103	GND	S104	USB3_OTG_ID [1]
P104	HDMI_HPD / DP1_HPD	S105	DP0_AUX+
P105	HDMI_CTRL_CK / DP1_AUX+	S106	DP0_AUX-
P106	HDMI_CTRL_DAT / DP1_AUX-	S107	LCD1_BKLT_EN [2]
P107	DP1_AUX_SEL	S108	LVDS1_CK+ / eDP1_AUX+ / DSI1_CLK+
P108	GPIO0 / CAM0_PWR#	S109	LVDS1_CK- / eDP1_AUX- / DSI1_CLK-
P109	GPIO1 / CAM1_PWR#	S110	GND
P110	GPIO2 / CAM0_RST#	S111	LVDS1_0+ / eDP1_TX0+ / DSI1_D0+
P111	GPIO3 / CAM1_RST#	S112	LVDS1_0- / eDP1_TX0- / DSI1_D0-
P112	GPIO4 / HDA_RST#	S113	eDP1_HPD / DSI1_TE [2]
P113	GPIO5 / PWM_OUT	S114	LVDS1_1+ / eDP1_TX1+ / DSI1_D1+
P114	GPIO6 / TACHIN	S115	LVDS1_1- / eDP1_TX1- / DSI1_D1-
P115	GPIO7	S116	LCD1_VDD_EN [2]
P116	GPIO8	S117	LVDS1_2+ / eDP1_TX2+ / DSI1_D2+
P117	GPIO9	S118	LVDS1_2- / eDP1_TX2- / DSI1_D2-
P118	GPIO10	S119	GND
P119	GPIO11	S120	LVDS1_3+ / eDP1_TX3+ / DSI1_D3+
P120	GND	S121	LVDS1_3- / eDP1_TX3- / DSI1_D3-
P121	I2C_PM_CK	S122	LCD1_BKLT_PWM [2]
P122	I2C_PM_DAT	S123	GPIO13
P123	BOOT_SEL0#	S124	GND
P124	BOOT_SEL1#	S125	LVDS0_0+ / eDP0_TX0+ / DSI0_D0+
P125	BOOT_SEL2#	S126	LVDS0_0- / eDP0_TX0- / DSI0_D0-
P126	RESET_OUT#	S127	LCD0_BKLT_EN
P127	RESET_IN#	S128	LVDS0_1+ / eDP0_TX1+ / DSI0_D1+
P128	POWER_BTN#	S129	LVDS0_1- / eDP0_TX1- / DSI0_D1-
P129	SER0_TX	S130	GND
P130	SER0_RX	S131	LVDS0_2+ / eDP0_TX2+ / DSI0_D2+

P-PIN	Primary (Top) Side	S-Pin	Secondary (Bottom) Side
P131	SER0_RTS#	S132	LVDS0_2- / eDP0_TX2- / DSI0_D2-
P132	SER0_CTS#	S133	LCD0_VDD_EN
P133	GND	S134	LVDS0_CK+ / eDP0_AUX+ / DSI0_CLK+
P134	SER1_TX	S135	LVDS0_CK- / eDP0_AUX- / DSI0_CLK-
P135	SER1_RX	S136	GND
P136	SER2_TX	S137	LVDS0_3+ / eDP0_TX3+ / DSI0_D3+
P137	SER2_RX	S138	LVDS0_3- / eDP0_TX3- / DSI0_D3-
P138	SER2_RTS#	S139	I2C_LCD_CK
P139	SER2_CTS#	S140	I2C_LCD_DAT
P140	SER3_TX	S141	LCD0_BKLT_PWM
P141	SER3_RX	S142	GPIO12
P142	GND	S143	GND
P143	CAN0_TX [2]	S144	eDP0_HPD / DSI0_TE
P144	CAN0_RX [2]	S145	WDT_TIME_OUT#
P145	CAN1_TX [2]	S146	PCIE_WAKE#
P146	CAN1_RX [2]	S147	VDD_RTC
P147	VDD_IN	S148	LID#
P148	VDD_IN	S149	SLEEP#
P149	VDD_IN	S150	VIN_PWR_BAD#
P150	VDD_IN	S151	CHARGING#
P151	VDD_IN	S152	CHARGER_PRSNT#
P152	VDD_IN	S153	CARRIER_STBY#
P153	VDD_IN	S154	CARRIER_PWR_ON
P154	VDD_IN	S155	FORCE_RECOV#
P155	VDD_IN	S156	BATLOW#
P156	VDD_IN	S157	TEST#
		S158	GND

Note

1. *Not supported*
2. *Not connected*
3. *Assembly option*

Table 18 PCIe Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
PCIE_A_TX+ PCIE_A_TX-	P89 P90	Differential PCIe link A transmit data pair	O LVDS PCIe		AC coupled with 220 nF on module
PCIE_B_TX+ PCIE_B_TX-	S90 S91	Differential PCIe link B transmit data pair	O LVDS PCIe		AC coupled with 220 nF on module
PCIE_C_TX+ PCIE_C_TX-	S81 S82	Differential PCIe link C transmit data pair	O LVDS PCIe		AC coupled with 220 nF on module
PCIE_D_TX+ PCIE_D_TX-	S29 S30	Differential PCIe link D transmit data pair	O LVDS PCIe		AC coupled with 220 nF on module
PCIE_A_RX+ PCIE_A_RX-	P86 P87	Differential PCIe link A receive data pair	I LVDS PCIe		
PCIE_B_RX+ PCIE_B_RX-	S87 S88	Differential PCIe link B receive data pair	I LVDS PCIe		
PCIE_C_RX+ PCIE_C_RX-	S78 S79	Differential PCIe link C receive data pair	I LVDS PCIe		
PCIE_D_RX+ PCIE_D_RX-	S32 S33	Differential PCIe link D receive data pair	I LVDS PCIe		
PCIE_A_REFCK+ PCIE_A_REFCK-	P83 P84	Differential PCIe Link reference clock output DC coupled	O LVDS PCIe		
PCIE_B_REFCK+ PCIE_B_REFCK-	S84 S85	Differential PCIe Link reference clock output DC coupled	O LVDS PCIe		
PCIE_C_REFCK+ PCIE_C_REFCK-	P80 P81	Differential PCIe Link reference clock output DC coupled	O LVDS PCIe		
PCIE_A_RST#	P75	PCIe port reset output	O 3.3V		
PCIE_B_RST#	S76	PCIe port reset output	O 3.3V		
PCIE_C_RST#	S77	PCIe port reset output	O 3.3V		
PCIE_WAKE#	S146	PCIe wake up interrupt to host common to PCIe links A, B, C, D	I OD 3.3V	PU 10 kΩ	

Table 19 LVDS Signal Description

Signals	Pins	Description	I/O	PU/PD	Comments
LVDS0_0+ LVDS0_0-	S125 S126	LVDS primary data channel, differential pair 0	O LVDS LCD		
LVDS0_1+ LVDS0_1-	S128 S129	LVDS primary data channel, differential pair 1	O LVDS LCD		
LVDS0_2+ LVDS0_2-	S131 S132	LVDS primary data channel, differential pair 2	O LVDS LCD		
LVDS0_3+ LVDS0_3-	S137 S138	LVDS primary data channel, differential pair 3	O LVDS LCD		
LVDS0_CK+ LVDS0_CK-	S134 S135	LVDS primary data channel differential clock pair	O LVDS LCD		
LCD0_VDD_EN	S133	LVDS primary channel power enable. High enables panel VDD	O 1.8V		
LCD0_BKLT_EN	S127	LVDS primary channel backlight enable. High enables panel backlight	O 1.8V		
LCD0_BKLT_PWM	S141	LVDS primary channel brightness via pulse width modulation (PWM)	O 1.8V		
LVDS1_0+ LVDS1_0-	S111 S112	LVDS secondary data channel, differential pair 0	O LVDS LCD		
LVDS1_1+ LVDS1_1-	S114 S115	LVDS secondary data channel, differential pair 1	O LVDS LCD		
LVDS1_2+ LVDS1_2-	S117 S118	LVDS secondary data channel, differential pair 2	O LVDS LCD		
LVDS1_3+ LVDS1_3-	S120 S121	LVDS secondary data channel, differential pair 3	O LVDS LCD		
LVDS1_CK+ LVDS1_CK-	S108 S109	LVDS secondary data channel differential clock pair	O LVDS LCD		
LCD1_VDD_EN	S116	LVDS secondary channel power enable. High enables panel VDD	O 1.8V		Not connected
LCD1_BKLT_EN	S107	LVDS secondary channel backlight enable. High enables panel backlight	O 1.8V		
LCD1_BKLT_PWM	S122	LVDS secondary channel brightness control via pulse width modulation (PWM)	O 1.8V		
I2C_LCD_DAT	S140	DDC data line for flat panel detection and control. Possible EDID EEPROM address conflicts may occur if multiple displays are implemented.	I/O OD 1.8V	PU 2.2 kΩ	
I2C_LCD_CK	S139	DDC clock line for flat panel detection and control	O OD 1.8V	PU 2.2 kΩ	

Note

LVDS is not supported if the optional eDP or MIPI-DSI is implemented.

Table 19.1 Optional eDP Signal Description

Signals	Pins	Description	I/O	PU/PD	Comments
eDP0_TX0+ eDP0_TX0-	S125 S126	eDP0 primary differential data pair 0	O LVDS DP		Not supported by default. AC coupling required off-module
eDP0_TX1+ eDP0_TX1-	S128 S129	eDP0 primary differential data pair 1	O LVDS DP		
eDP0_TX2+ eDP0_TX2-	S131 S132	eDP0 primary differential data pair 2	O LVDS DP		
eDP0_TX3+ eDP0_TX3-	S137 S138	eDP0 primary differential data pair 3	O LVDS DP		
eDP0_AUX+ eDP0_AUX-	S134 S135	eDP0 primary auxiliary differential pair for link management and device control	O LVDS DP		
LCD0_VDD_EN	S133	Primary panel power enable. High enables panel VDD	O 1.8V		
LCD0_BKLT_EN	S127	Primary backlight enable. High enables panel backlight	O 1.8V		
LCD0_BKLT_PWM	S141	Primary backlight brightness control via pulse width modulation (PWM)	O 1.8V		
eDP0_HPD	S144	eDP0 Hot Plug Detect pins for primary eDP display	I 1.8V	PD 100 kΩ	100 kΩ pull-down resistor is present only on variants with eDP support
eDP1_TX0+ eDP1_TX0-	S111 S112	eDP1 secondary differential data pair 0	O LVDS DP		Not supported
eDP1_TX1+ eDP1_TX1-	S114 S115	eDP1 secondary differential data pair 1	O LVDS DP		
eDP1_TX2+ eDP1_TX2-	S117 S118	eDP1 secondary differential data pair 2	O LVDS DP		
eDP1_TX3+ eDP1_TX3-	S120 S121	eDP1 secondary differential data pair 3	O LVDS DP		
eDP1_AUX+ eDP1_AUX-	S108 S109	eDP1 secondary auxiliary differential pair for link management and device control	O LVDS DP		
LCD1_VDD_EN	S116	Secondary panel power enable. High enables panel VDD	O 1.8V		Not connected
LCD1_BKLT_EN	S107	Secondary panel backlight enable. High enables panel backlight	O 1.8V		
LCD1_BKLT_PWM	S122	Secondary panel backlight brightness control via pulse width modulation (PWM)	O 1.8V		
eDP1_HPD	S113	eDP1 Hot Plug Detect pins	I 1.8V		
I2C_LCD_DAT	S140	I2C data to read LCD display EDID EEPROMs. Possible EDID EEPROM address conflicts may occur if multiple displays are implemented	I/O OD 1.8V	PU 2.2 kΩ	Optional - eDP panel information is usually via the eDP auxiliary pair
I2C_LCD_CK	S139	I2C clock to read LCD display EDID EEPROMs	O 1.8V	PU 2.2 kΩ	Optional - eDP panel information is usually via the eDP auxiliary pair

Note

LVDS is not supported if the optional eDP or MIPI-DSI is implemented.

Table 20 HDMI Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
HDMI_D0+ HDMI_D0-	P98 P99	TMDS / HDMI differential data pair 0	O TMDS		
HDMI_D1+ HDMI_D1-	P95 P96	TMDS / HDMI differential data pair 1	O TMDS		
HDMI_D2+ HDMI_D2-	P92 P93	TMDS / HDMI differential data pair 2	O TMDS		
HDMI_CK+ HDMI_CK-	P101 P102	TMDS / HDMI differential clock pair	O TMDS		
HDMI_CTRL_CK	P105	I2C clock line dedicated to HDMI	O 1.8V OD	PU 100 kΩ	Level shifter FET and 5V PU resistor shall be placed between the module and the HDMI connector
HDMI_CTRL_DAT	P106	I2C data line dedicated to HDMI	I/O 1.8V OD	PU 100 kΩ	
HDMI_HPD	P104	HDMI Hot plug active high detection signal that serves as an interrupt request	I 1.8V	PD 1 MΩ	

Note

For HDMI operation, drive DP1_AUX_SEL (pin P107) to 1.8 V on the carrier board.

Table 20.1 DP++ Operation Over HDMI Pins Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
DP1_LANE0+ DP1_LANE0-	P92 P93	DisplayPort differential data pair 0	LVDS DP		AC coupled off module
DP1_LANE1+ DP1_LANE1-	P95 P96	DisplayPort differential data pair 1	LVDS DP		
DP1_LANE2+ DP1_LANE2-	P98 P99	DisplayPort differential data pair 2	LVDS DP		
DP1_LANE3+ DP1_LANE3-	P101 P102	DisplayPort differential data pair 3	LVDS DP		
DP1_HPD	P104	DisplayPort Hot Plug Detect	I 1.8V	PD 1 MΩ	
DP1_AUX+	P105	DisplayPort auxiliary differential pair. Used for link management and device control	I/O 1.8V OD	PD 100 kΩ	AC coupled on module
DP1_AUX-	P106			PU 100 kΩ	
DP1_AUX_SEL	P107	Pull to GND on carrier for DP operation in dual-mode (DP++) implementations. Drive to 1.8V on carrier for HDMI operation. Terminated on module through 1M resistor to GND	I 1.8V	PD 1 MΩ	

Note

The conga-SA8 offers this interface as an assembly option.

Table 21 DisplayPort++

Signal	Pin #	Description	I/O	PU/PD	Comment
DP0_LANE0+ DP0_LANE0-	S93 S94	DisplayPort differential data pair 0	LVDS DP		AC coupled off module
DP0_LANE1+ DP0_LANE1-	S96 S97	DisplayPort differential data pair 1	LVDS DP		
DP0_LANE2+ DP0_LANE2-	S99 S100	DisplayPort differential data pair 2	LVDS DP		
DP0_LANE3+ DP0_LANE3-	S102 S103	DisplayPort differential data pair 3	LVDS DP		
DP0_HPD	S98	DisplayPort Hot Plug Detect	I 1.8V	PD 1 MΩ	
DP0_AUX+	S105	DisplayPort auxiliary differential pair. Used for link management and device control	LVDS PCIE	PD 100 kΩ	AC coupled on module
DP0_AUX-	S106		LVDS PCIE	PU 100 kΩ	
DP0_AUX_SEL	S95	Pulled to GND on carrier for DP operation in dual-mode (DP++) implementations	I 1.8V	PD 1 MΩ	

Table 21.1 Optional MIPI-DSI Signal Description

Signals	Pins	Description	I/O	PU/PD	Comments
DSI0_D0+ DSI0_D0-	S125 S126	DSI0 primary differential data pair 0	O LVDS D-PHY		Not supported by default
DSI0_D1+ DSI0_D1-	S128 S129	DSI0 primary differential data pair 1	O LVDS D-PHY		
DSI0_D2+ DSI0_D2-	S131 S132	DSI0 primary differential data pair 2	O LVDS D-PHY		
DSI0_D3+ DSI0_D3-	S137 S138	DSI0 primary differential data pair 3	O LVDS D-PHY		
DSI0_CLK+ DSI0_CLK-	S134 S135	DSI0 primary differential clock pair	O LVDS D-PHY		
DSI0_TE	S144	DSI0 primary panel tearing effect signal	I 1.8V		
LCD0_VDD_EN	S133	Primary panel power enable. High enables panel VDD	O 1.8V		
LCD0_BKLT_EN	S127	Primary panel backlight enable. High enables panel backlight	O 1.8V		
LCD0_BKLT_PWM	S141	Primary panel backlight brightness control via pulse width modulation (PWM)	O 1.8V		
DSI1_D0+ DSI1_D0-	S111 S112	DSI1 secondary differential data pair 0	O LVDS D-PHY		

Signals	Pins	Description	I/O	PU/PD	Comments
DSI1_D1+ DSI1_D1-	S114 S115	DSI1 secondary differential data pair 1	O LVDS D-PHY		Not supported by default
DSI1_D2+ DSI1_D2-	S117 S118	DSI1 secondary differential data pair 2	O LVDS D-PHY		
DSI1_D3+ DSI1_D3-	S120 S121	DSI1 secondary differential data pair 3	O LVDS D-PHY		
DSI1_CLK+ DSI1_CLK-	S108 S109	DSI1 secondary differential clock pair	O LVDS D-PHY		
LCD1_VDD_EN	S116	Secondary panel power enable. High enables panel VDD	O 1.8V		Not connected
LCD1_BKLT_EN	S107	Secondary panel backlight enable. High enables panel backlight	O 1.8V		
LCD1_BKLT_PWM	S122	Secondary panel backlight brightness via pulse width modulation (PWM)	O 1.8V		
DSI1_TE	S113	DSI1 secondary panel tearing effect signal	I 1.8V		
I2C_LCD_DAT	S140	DDC data line for flat panel detection and control. Possible EDID EEPROM address conflicts may occur if multiple displays are implemented	I/O OD 1.8V	PU 2.2 kΩ	
I2C_LCD_CK	S139	DC clock line for flat panel detection and control	O 1.8V	PU 2.2 kΩ	

Note

LVDS is not supported if the optional eDP or MIPI-DSI is implemented.

Table 22 MIPI CSI-2/-3

Signal	Pin #	Description	I/O	PU/PD	Comment
CSI0_RX0+ CSI0_RX0-	S11 S12	CSI0 differential data pair 0	I LVDS D-PHY		Not supported
CSI0_RX1+ CSI0_RX1-	S14 S15	CSI0 differential data pair 1	I LVDS D-PHY		
CSI0_CK+ CSI0_CK-	S8 S9	CSI0 differential clock pair	I LVDS D-PHY		
CAM0_PWR# / GPIO0	P108	Camera 0 power enable, active low output/ General Purpose Input Output 0	I/O 1.8V		Supports only GPIO
CAM0_RST# / GPIO2	P110	Camera 0 reset, active low output / General Purpose Input Output 2	I/O 1.8V		
I2C_CAM0_CK / CSI0_TX+	S5	I2C clock (serial camera support link for serial cameras)	I/O OD 1.8V	PU 1 kΩ	Not supported
I2C_CAM0_DAT / CSI0_TX-	S7	I2C data (serial camera support link for serial cameras)	I/O OD 1.8V	PU 1 kΩ	

Signal	Pin #	Description	I/O	PU/PD	Comment
CSI1_RX0+ CSI1_RX0-	P7 P8	CSI1 differential data pair 0	I LVDS D-PHY		Not supported
CSI1_RX1+ CSI1_RX1-	P10 P11	CSI1 differential data pair 1	I LVDS D-PHY		
CSI1_RX2+ CSI1_RX2-	P13 P14	CSI1 differential data pair 2	I LVDS D-PHY		
CSI1_Rx3+ CSI1_RX3-	P16 P17	CSI1 differential data pair 3	I LVDS D-PHY		
CSI1_CK+ CSI1_CK-	P3 P4	CSI1 differential clock pair	I LVDS D-PHY		
CAM1_PWR# / GPIO1	P109	Camera 1 power enable, active low output / General Purpose Input Output 1	I/O 1.8V		Supports only GPIO
CAM1_RST# / GPIO3	P111	Camera 1 reset, active low output / General Purpose Input Output 3	I/O 1.8V		
CAM_MCK	S6	Master clock output for CSI camera support. May be used for CSI0 or CSI1 or both	O 1.8V		Not supported
I2C_CAM1_CK / CSI1_TX+	S1	I2C clock (serial camera support link for serial cameras)	I/O OD 1.8V	PU 1 kΩ	
I2C_CAM1_DAT / CSI1_TX-	S2	I2C data (serial camera support link for serial cameras)	I/O OD 1.8V	PU 1 kΩ	

Note

The conga-SA8 does not support MIPI-CSI

Table 23 SATA Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
SATA_TX+ SATA_TX-	P48 P49	SATA 0 transmit differential data pair	O SATA		Supports SATA specification, revision 3.2
SATA_RX+ SATA_RX-	P51 P52	SATA 0 receive differential data pair	I SATA		Supports SATA specification, revision 3.2
SATA_ACT#	S54	Active low SATA activity indicator	O OD 3.3V		Up to 24 mA LED current

Table 24 Gigabit Ethernet Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
GBE0_MDI0+ GBE0_MDI0-	P30 P29	Bidirectional transmit/receive pair 0 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE1_MDI0+ GBE1_MDI0-	S17 S18	Bidirectional transmit/receive pair 0 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE0_MDI1+ GBE0_MDI1-	P27 P26	Bidirectional transmit/receive pair 1 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE1_MDI1+ GBE1_MDI1-	S20 S21	Bidirectional transmit/receive pair 1 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE0_MDI2+ GBE0_MDI2-	P24 P23	Bidirectional transmit/receive pair 2 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE1_MDI2+ GBE1_MDI2-	S23 S24	Bidirectional transmit/receive pair 2 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE0_MDI3+ GBE0_MDI3-	P20 P19	Bidirectional transmit/receive pair 3 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE1_MDI3+ GBE1_MDI3-	S26 S27	Bidirectional transmit/receive pair 3 to magnetics (Media Dependent Interface)	I/O GBE MDI		
GBE0_LINK100# GBE1_LINK100#	P21 S19	Link speed indication LED for 100 Mb/s	O OD 3.3V		Up to 24 mA LED current
GBE0_LINK1000# GBE1_LINK1000#	P22 S22	Link speed indication LED for 1000 Mb/s	O OD 3.3V		Up to 24 mA LED current
GBE0_LINK_ACT# GBE1_LINK_ACT#	P25 S31	Link or activity indication LED. Driven low on link (10, 100 or 1000 Mb/s). Blinks on activity	O OD 3.3V		Up to 24 mA LED current
GBE0_CTREF GBE1_CTREF	P28 S28	Center-tap reference voltage for carrier board Ethernet magnetic (if required by the module GBE PHY)	O		Not connected
GBE0_SDP GBE1_SDP	P6 P5	IEEE 1588 trigger signal. For hardware implementation of PTP (precision time protocol). This is typically implemented by the software-defined pins from the Ethernet controller. The SDP pins can be used for IEEE1588 auxiliary device connections and for other miscellaneous hardware or software-control purposes	I/O 3.3V		Signals are provided by Intel SoC

Table 25 USB Pinout Description

Signal	Pin #	Description	I/O	PU/PD	Comment
USB0+ USB0-	P60 P61	Differential USB 2.0 data pairs	I/O USB		
USB1+ USB1-	P65 P66	Differential USB 2.0 data pairs	I/O USB		
USB2+ USB2-	P69 P70	Differential USB 2.0 data pairs	I/O USB		
USB3+ USB3-	S68 S69	Differential USB 2.0 data pairs	I/O USB		
USB4+ USB4-	S35 S36	Differential USB 2.0 data pairs	I/O USB		
USB5+ USB5-	S59 S60	Differential USB 2.0 data pairs	I/O USB		
USB0_EN_OC# USB1_EN_OC# USB2_EN_OC# USB3_EN_OC# USB4_EN_OC# USB5_EN_OC#	P62 P67 P71 P74 P76 S55	Pulled low by module to disable USB0 power. Pulled low by carrier OD driver to indicate over-current situation. A pull-up to a 3.3V rail shall be present on the module	I/O OD 3.3V	PU 10 kΩ	
USB0_VBUS_DET	P63	USB host power detection when this port is used as a device	I USB VBUS 5V	PD 100 kΩ	
USB3_VBUS_DET	S37	USB host power detection when this port is used as a device	I USB VBUS 5V	PD 100 kΩ	Not supported by default (assembly option)
USB0_OTG_ID USB3_OTG_ID	P64 S104	USB OTG ID input, active high	I 3.3V	PU 100 kΩ	Not supported
USB2SSRX+ USB2SSRX-	S74 S75	Receive signal differential pairs for SuperSpeed USB data coupling caps for RX pairs are off-module	I USB SS		
USB2SSTX+ USB2SSTX-	S71 S72	Transmit signal differential pairs for SuperSpeed USB data coupling caps for TX pairs are on-module	O USB SS		
USB3SSRX+ USB3SSRX-	S65 S66	Receive signal differential pairs for SuperSpeed USB data coupling caps for RX pairs are off-module	I USB SS		
USB3SSTX+ USB3SSTX-	S62 S63	Transmit signal differential pairs for SuperSpeed USB data coupling caps for TX pairs are on-module	O USB SS		

Note

1. *The conga-SA8 does not support USB OTG.*
2. *USB port 0 supports only USB 2.0 dual role.*

Table 26 I2S Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
I2S0_LRCK	S39	Left and right audio synchronization clock	I/O 1.8V		Not supported by default
I2S0_SDOUT	S40	Digital audio output	O 1.8V		
I2S0_SDIN	S41	Ditial audio input	I 1.8V		
I2S0_CK	S42	Digital audio clock	I/O 1.8V		
AUDIO_MCK	S38	Master clock output to audio codecs	O 1.8V		

Note

The conga-SA8 does not support I2S.

Table 27 HDA Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
HDA_SYNC	S50	HD audio serial bus synchronization.	I/O 1.8V		
HDA_SDO	S51	HD audio serial data output to codec	O 1.8V	PD 100 kΩ	
HDA_SDI	S52	HD audio serial data input from codec	I 1.8V		
HDA_CK	S53	HD audio serial bit clock to codec	I/O 1.8V		
HDA_RST# /GPIO4	P112	HD audio codec reset	O 1.8V		The default is HDA_RST#.

Note

The conga-SA8 offers the HDA by default.

Table 28 SDIO Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
SDIO_D0 SDIO_D1 SDIO_D2 SDIO_D3	P39 P40 P41 P42	SDIO Data lines	I/O 3.3V		Not connected
SDIO_CMD	P34	SDIO Command/Response. This signal is used for card initialization and for command transfers	I/O 3.3V		

SDIO_CK	P36	SDIO Clock. With each cycle of this signal a one-bit transfer on the command and each data line occurs	O 3.3V		Not connected
SDIO_WP	P33	SDIO Write Protect. This signal denotes the state of the write-protect tab on SD cards	I OD 3.3V		
SDIO_CD#	P35	SDIO Card Detect. This signal indicates when a SDIO/MMC card is present	I OD 3.3V		
SDIO_PWR_EN	P37	SDIO Power Enable. This signal is used to enable the power being supplied to a SD/MMC card device	O 3.3V		

Note

The SoC does not support SDIO.

Table 29 Asynchronous Serial Port Signal Description

Signal	Pin #	Description	I/O	PU/PD	Comment
SER0_TX	P129	Asynchronous serial data output port 0	O 1.8V		congatec Board Controller UART
SER0_RX	P130	Asynchronous serial data input port 0	I 1.8V	PU 47.5 kΩ	
SER0_RTS#	P131	Request to Send handshake line for SER0	O 1.8V		
SER0_CTS#	P132	Clear to Send handshake line for SER0	I 1.8V	PU 47.5 kΩ	
SER1_TX	P134	Asynchronous serial data output port 1	O 1.8V		SoC UART
SER1_RX	P135	Asynchronous serial data input port 1	I 1.8V		
SER2_TX	P136	Asynchronous serial data output port 2	O 1.8V		
SER2_RX	P137	Asynchronous serial data input port 2	I 1.8V		
SER2_RTS#	P138	Request to Send handshake line for SER2	O 1.8V		
SER2_CTS#	P139	Clear to Send handshake line for SER2	I 1.8V		
SER3_TX	P140	Asynchronous serial data output port 3	O 1.8V		congatec Board Controller UART
SER3_RX	P141	Asynchronous serial data input port 3	I 1.8V		

Table 30 CAN Bus Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
CAN0_TX	P143	CAN port 0 transmit output	O 1.8V		Not connected
CAN0_RX	P144	CAN port 0 receive input	I 1.8V		
CAN1_TX	P145	CAN port 1 transmit output	O 1.8V		
CAN1_RX	P146	CAN port 1 receive input	I 1.8V		

Note

The conga-SA8 does not support CAN bus.

Table 31 GPIO Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
GPIO0	P108	Bidirectional general purpose input/output	I/O 1.8V		Controlled by the cBC. Default BIOS setting: General purpose output
GPIO1	P109	Bidirectional general purpose input/output	I/O 1.8V		
GPIO2	P110	Bidirectional general purpose input/output	I/O 1.8V		
GPIO3	P111	Bidirectional general purpose input/output	I/O 1.8V		
GPIO4 / HDA_RST#	P112	Bidirectional general purpose input/output Alternate use: HD audio reset HDA_RST# (active low output)	I/O 1.8V		Controlled by the cBC. Default BIOS setting: HD audio reset
GPIO5 / PWM_OUT	P113	Bidirectional general purpose input/output Alternate use: Pulse Width Modulation output PWM_OUT	I/O 1.8V		Controlled by the cBC. Default BIOS setting: Pulse Width Modulation output
GPIO6 / TACHIN	P114	Bidirectional general purpose input/output Alternate use: Tachometer input TACHIN	I/O 1.8V		Controlled by the cBC. Default BIOS setting: Tachometer input
GPIO7	P115	Bidirectional general purpose input/output	I/O 1.8V		Non-multiplexed GPIOs controlled by the cBC. Default BIOS setting: General purpose input
GPIO8	P116	Bidirectional general purpose input/output	I/O 1.8V		
GPIO9	P117	Bidirectional general purpose input/output	I/O 1.8V		
GPIO10	P118	Bidirectional general purpose input/output	I/O 1.8V		
GPIO11	P119	Bidirectional general purpose input/output	I/O 1.8V		
GPIO12	S142	Bidirectional general purpose input/output	I/O 1.8V		
GPIO13	S123	Bidirectional general purpose input/output	I/O 1.8V		

Note

Pins P112-P114 support alternate use by default. For GPIO functionality, change the default configuration in the BIOS menu under Advanced -> GPIO Configuration submenu.

Table 32 SPI0 Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
SPI0_CS0#	P43	SPI0 master chip select 0 output for selecting SPI boot device	O 1.8V	PU 100 kΩ	Only for a BIOS flash device
SPI0_CS1#	P31	SPI0 master chip select 1 output for selecting the second flash device when two devices are used. Do not use when only one SPI device is used	O 1.8V		Only for a BIOS flash device
SPI0_CK	P44	SPI0 master clock output	O 1.8V	PD 100 kΩ	
SPI0_DIN	P45	SPI0 master data input (SPI serial input data from the SPI device to SMARC® module)	I 1.8V		Also referred to as MISO
SPI0_DO	P46	SPI0 master data output (SPI serial output data from SMARC® module to the SPI device	O 1.8V	PU 4.75 kΩ	Also referred to as MOSI This signal has special functionality during reset process (bootstrap signal).

Note

The BIOS SPI flash and TPM module are connected to SPI0 bus.

Table 33 I2C Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
I2C_GP_CK	S48	I2C General purpose clock signal	I/O 1.8V	PU 2.2 kΩ	
I2C_GP_DAT	S49	I2C General purpose data signal	I/O 1.8V	PU 2.2 kΩ	

Table 34 eSPI Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
ESPI_CS0#	P54	ESPI master chip select outputs. Driving Chip Select# low selects a particular eSPI slave for the transaction. Each of the eSPI slaves is connected to a dedicated Chip Select# pin	O 1.8V		Only ESPI_CS0# is supported on the SMARC connector.
ESPI_CS1#	P55			PU 10 kΩ 1.8V	
ESPI_CK	P56	ESPI master clock output. This pin provides the reference timing for all the serial input and output operations	O 1.8V		
ESPI_RESET#	S58	Resets the eSPI interface for both master and slaves. ESPI_RESET# is typically driven from eSPI master to eSPI slaves	O 1.8V	PD 75 kΩ	

ESPI_ALERT0#	S43	These pins are used by eSPI slaves to request service from eSPI master. ALERT[0/1]# is an open-drain output from the slave. This pin is optional for single master-single slave configuration where I/O[1] can be used to signal the alert event	I 1.8V	PU 10 kΩ 1.8V	
ESPI_ALERT1#	S44			PU 100 kΩ 1.8V	
ESPI_IO_0	P58	ESPI master data input/outputs. These bi-directional input/output pins are used to transfer data between master and slaves. In single I/O mode, ESPI_IO_0 is the eSPI master output/eSPI slave input (MOSI) whereas ESPI_IO_1 is the eSPI master input/eSPI slave output (MISO)	I/O 1.8V		
ESPI_IO_1	P57				
ESPI_IO_2	S56				
ESPI_IO_3	S57				

Table 35 SERDES Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
SERDES_1_TX+ SERDES_1_TX-	S81 S82	Differential SERDES 1 Transmit Data Pair	O PCIE		Not supported
SERDES_1_RX+ SERDES_1_RX-	S78 S79	Differential SERDES 1 Receive Data Pair	I PCIE		
SERDES_0_TX+ SERDES_0_TX-	S29 S30	Differential SERDES 0 Transmit Data Pair	O PCIE		
SERDES_0_RX+ SERDES_0_RX-	S32 S33	Differential SERDES 0 Receive Data Pair	I PCIE		
MDIO_CLK	S45	MDIO Signals to Configure Possible PHYs	O 1.8V		
MDIO_DAT	S46	MDIO Signals to Configure Possible PHYs	I/O OD 1.8V		

Note

The conga-SA8 does not support SERDES.

Table 36 Watchdog Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
WDT_TIME_OUT#	S145	Watchdog timer output, low active	O 1.8V	PD 100 kΩ	Driven only during runtime

Table 37 Management Pins Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
VIN_PWR_BAD#	S150	Power bad indication from carrier board. Module and carrier power supplies (other than module and carrier power supervisory circuits) will not be enabled while this signal is held low by the carrier. Pulled up on module. Driven by OD part on carrier	I VDD_IN	PU 10 kΩ	
CARRIER_PWR_ON	S154	Carrier board circuits (apart from power management and power path circuits) should not be powered up until the module asserts the CARRIER_PWR_ON signal.	O 1.8V	PD 100 kΩ	
CARRIER_STBY#	S153	The module shall drive this signal low when the system is in a standby power state	O 1.8V	PD 100 kΩ	Connected to SUS_S3#
RESET_OUT#	P126	General purpose reset output to carrier board	O 1.8V	PU 10 kΩ 1.8V	
RESET_IN#	P127	Reset input from carrier board. Carrier drives low to force a module reset, floats the line otherwise. Pulled up on module. Driven by OD part on carrier	I OD 3.3V	PU 10 kΩ 3.3V	
POWER_BTN#	P128	Power-button input from carrier board. Carrier to float the line in in-active state. Active low, level sensitive. Should be de-bounced on the module. Pulled-up on module. Driven by OD part on carrier This signal shall be level triggered during bootup to allow to stop the module from booting. After bootup, it may act as an edge triggered signal	I OD 3.3V	PU 10 kΩ 3.3V	
SLEEP#	S149	Sleep indicator from carrier board. May be sourced from user Sleep button or carrier logic. Carrier to float the line in in-active state. Active low, level sensitive. Should be de-bounced on the module. Pulled-up on module. Driven by OD part on carrier	I OD 3.3V	PU 10 kΩ 3.3V	
LID#	S148	Lid open/close indication to module. Low indicates lid closure (which system may use to initiate a sleep state). Carrier to float the line in in-active state. Active low, level sensitive. Should be de-bounced on the module. Pulled-up on module. Driven by OD part on carrier	I OD 3.3V	PU 10 kΩ 3.3V	
BATLOW#	S156	Battery low indication to module. Carrier to float the line in in-active state. Pulled up on module. Driven by OD part on carrier	I OD 1.8V	PU 10 kΩ 1.8V	
I2C_PM_DAT	P122	Power management I2C bus data and clock. On x86 systems these serve as SMB data and clock	I/O OD 1.8V	PU 2.2 kΩ 1.8V	
I2C_PM_CK	P121				
CHARGING#	S151	Held low by carrier during battery charging. Carrier to float the line when charge is complete. Pulled-up on module. Driven by OD part on carrier	I OD 3.3V	PU 10 kΩ 3.3V	
CHARGER_PRSNT#	S152	Held low by carrier if DC input for battery charger is present. Pulled up on module. Driven by OD part on carrier	I OD 3.3V	PU 10 kΩ 3.3V	
TEST#	S157	Held low by carrier to invoke module vendor specific test function(s). Pulled up on module. Driven by OD part on carrier	I OD 3.3V	PU 100 kΩ 3.3V	
SMB_ALERT_1V8#	P1	SMBus Alert# (interrupt) signal	I OD 1.8V	PU 2.2 kΩ 1.8V	

Table 38 Boot Select Signal Description

Signal Name	Pin	Description	I/O	PU/PD	Comment
BOOT_SEL0# BOOT_SEL1# BOOT_SEL2#	P123 P124 P125	Input straps determine the module's boot device. Pulled up on the module. Driven by OD part on carrier	I 1.8V	PU 10 kΩ 1.8V	
FORCE_RECOV#	S155	Low on this pin allows non-protected segments of module boot device to be rewritten or restored from an external USB Host on module USB0. The module USB0 operates in Client Mode when the Force Recovery function is invoked. Pulled high on the module. For SoCs that do not implement a USB based Force Recovery functions, then a low on the module FORCE_RECOV# pin may invoke the SOC native Force Recovery mode – such as over a Serial Port. For x86 systems this signal may be used to load BIOS defaults. Pulled up on module. Driven by OD part on carrier	I 1.8V	PU 10 kΩ 1.8V	Not supported

Table 38.1 Boot Source Description

Carrier Connection			Boot Source
BOOT_SEL2#	BOOT_SEL1#	BOOT_SEL0#	
GND	GND	GND	Carrier SATA
GND	GND	Float	Carrier SD Card
GND	Float	GND	Carrier eSPI (CS0#)
GND	Float	Float	Carrier SPI (CS0#)
Float	GND	GND	Module device (NAND, NOR) - vendor specific
Float	GND	Float	Remote boot (GbE, serial) - vendor specific
Float	Float	GND	Module eMMC flash
Float	Float	Float	Module SPI

Note

1. *The conga-SA8 supports only Carrier SPI boot source (GND, Float, Float) configuration.*
2. *For other boot source configurations, the conga-SA8 will boot from on-module SPI flash.*

Table 38.2 Boot Strap Signal Description

Signal	Pin #	Description of Boot Strap Signal	I/O	PU/PD	Comment
SPI0_DO	P46	SPI0 master data output (SPI serial output data from SMARC® module to the SPI device	O 1.8V	PU 4.75 kΩ	
HDA_SDO	S51	HD audio serial data output to codec	O 1.8V	PD 100 kΩ	

Caution

1. *The signals listed in the table above are used as chipset configuration straps during system reset. In this condition (during reset), the signals are inputs that are pulled to the correct state by either the resistors implemented on the conga-SA8 or the internal resistors in the chipset.*

2. *No external DC loads or external pull-up or pull-down resistors should change the configuration of the signals listed in the above table.*

3. *External resistors may override the internal strap states and cause the SMARC module to malfunction and/or cause irreparable damage to the module.*

Table 39 Power and GND Signal Descriptions

Signal	Pin #	Description	I/O	PU/PD	Comment
VDD_IN	P147, P148, P149, P150, P151, P152, P153, P154, P155, P156	Module power input voltage—4.75V min. to 5.25V max.	P		
GND	P2, P9, P12, P15, P18, P32, P38, P47, P50, P53, P59, P68, P79, P82, P85, P88, P91, P94, P97, P100, P103, P120, P133, P142 S3, S10, S16, S25, S34, S47, S61, S64, S67, S70, S73, S80, S83, S86, S89, S92, S101, S110, S119, S124, S130, S136, S143, S158	Power Ground	P		
VDD_RTC	S147	Low current RTC circuit backup power—3.0V nominal. May be sourced from a carrier based lithium cell or super cap. This option requires a customized variant.	P		Assembly option for sourcing

Note

External 3.3 V is required for RTC battery implementation with supercap. Default conga-SA8 configuration does not support supercap charging. The supercap charging is only possible with an assembly option.

10 System Resources

TBD

11 BIOS Setup Description

11.1 Navigating the BIOS Setup Menu

The BIOS setup menu shows the features and options supported in the congatec BIOS. To access and navigate the BIOS setup menu, press the <DEL> or <F2> key during POST. The right frame displays the key legend. Above the key legend is an area reserved for text messages. These text messages explain the options and the possible impacts when changing the selected option in the left frame.

11.2 BIOS Versions

The BIOS displays the BIOS project name and the revision code during POST, and on the main setup screen. The initial production BIOS for conga-SA8 is identified as SA80R1xx, where:

- R is the identifier for a BIOS ROM file,
- 1 is the so called feature number and
- xx is the major and minor revision number.

The SA80 binary size is 32 MB.

11.3 Updating the BIOS

BIOS updates are recommended to correct platform issues or enhance the feature set of the module. The conga-SA8 features a congatec/AMI AptioEFI firmware on an onboard flash ROM chip. You can update the firmware with the congatec System Utility. The utility has five versions—UEFI shell, DOS based command line[1], Win32 command line, Win32 GUI, and Linux version.

For more information about "Updating the BIOS" refer to the user's guide for the congatec System Utility "CGUTLm1x.pdf" on the congatec website at www.congatec.com.

Note

1. *Deprecated*

11.3.1 Update from External Flash

For instructions on how to update the BIOS from external flash, refer to the AN7_External_BIOS_Update.pdf application note on the congatec website at http://www.congatec.com.

11.4 Supported Flash Devices

The conga-SA8 supports the following flash devices:

- W25R256JWPIQ (DFN6x5 package) 32 MB

The flash device listed above can be used on the carrier board to support external BIOS. For more information about external BIOS support, refer to the Application Note “AN7_External_BIOS_Update.pdf” on the congatec website at http://www.congatec.com.