conga-IC175 Thin Mini-ITX SBC

Detailed Description Of The congatec Thin Mini-ITX Based On 7th Generation Intel U-Series SoC

User's Guide

Revision 0.2 (Preliminary)

Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
0.1	2017.01.18	AEM	• Preliminary release
0.2	2017.12.05	AEM	• Updated section 5.8.1 "Standard SATA Connectors" • Updated table 43 "Feature Connector X38 Pinout Description" • Added content to section 8 "BIOS Setup Description"

Preface

This user's guide provides information about the components, features and connectors available on the conga-IC175 Thin Mini-ITX single board.

Disclaimer

The information contained within this user's guide, including but not limited to any product specification, is subject to change without notice.

congatec AG provides no warranty with regard to this user's guide or any other information contained herein and hereby expressly disclaims any implied warranties of merchantability or fitness for any particular purpose with regard to any of the foregoing. congatec AG assumes no liability for any damages incurred directly or indirectly from any technical or typographical errors or omissions contained herein or for discrepancies between the product and the user's guide. In no event shall congatec AG be liable for any incidental, consequential, special, or exemplary damages, whether based on tort, contract or otherwise, arising out of or in connection with this user's guide or any other information contained herein or the use thereof.

Intended Audience

This user's guide is intended for technically qualified personnel. It is not intended for general audiences.

Lead-Free Designs (RoHS)

All congatec AG products are created from lead-free components and are completely RoHS compliant.

Electrostatic Sensitive Device

All electronic parts described in this user's guide are electrostatic sensitive devices and are packaged accordingly. Do not open or handle a carrier board or module except at an electrostatic-free workstation. Additionally, do not ship or store electronic devices near strong electrostatic, electromagnetic, magnetic, or radioactive fields unless the device is contained within its original manufacturer's packaging.

Symbols

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.

Connector Type

Describes the connector used on the Single Board Computer.

Copyright Notice

Trademarks

Product names, logos, brands, and other trademarks featured or referred to within this user's guide, or the congatec website, are the property of their respective trademark holders. These trademark holders are not affiliated with congatec AG, our products, or our website.

Warranty

congatec AG makes no representation, warranty or guaranty, express or implied regarding the products except its standard form of limited warranty ("Limited Warranty") per the terms and conditions of the congatec entity, which the product is delivered from. These terms and conditions can be downloaded from www.congatec.com. congatec AG may in its sole discretion modify its Limited Warranty at any time and from time to time.

The products may include software. Use of the software is subject to the terms and conditions set out in the respective owner's license agreements, which are available at www.congatec.com and/or upon request.

Beginning on the date of shipment to its direct customer and continuing for the published warranty period, congatec AG represents that the products are new and warrants that each product failing to function properly under normal use, due to a defect in materials or workmanship or due to non conformance to the agreed upon specifications, will be repaired or exchanged, at congatec's option and expense.

Customer will obtain a Return Material Authorization ("RMA") number from congatec AG prior to returning the non conforming product freight prepaid. congatec AG will pay for transporting the repaired or exchanged product to the customer.

Repaired, replaced or exchanged product will be warranted for the repair warranty period in effect as of the date the repaired, exchanged or replaced product is shipped by congatec, or the remainder of the original warranty, whichever is longer. This Limited Warranty extends to congatec's direct customer only and is not assignable or transferable.

Except as set forth in writing in the Limited Warranty, congatec makes no performance representations, warranties, or guarantees, either express or implied, oral or written, with respect to the products, including without limitation any implied warranty (a) of merchantability, (b) of fitness for a particular purpose, or (c) arising from course of performance, course of dealing, or usage of trade.

congatec AG shall in no event be liable to the end user for collateral or consequential damages of any kind. congatec shall not otherwise be liable for loss, damage or expense directly or indirectly arising from the use of the product or from any other cause. The sole and exclusive remedy against congatec, whether a claim sound in contract, warranty, tort or any other legal theory, shall be repair or replacement of the product only.

Certification

congatec AG is certified to DIN EN ISO 9001 standard.

Technical Support

congatec AG technicians and engineers are committed to providing the best possible technical support for our customers so that our products can be easily used and implemented. We request that you first visit our website at www.congatec.com for the latest documentation, utilities and drivers, which have been made available to assist you. If you still require assistance after visiting our website then contact our technical support department by email at support@congatec.com

Terminology

Term	Description
PCIe	Peripheral Component Interface Express
cBC	congatec Board Controller
SDIO	Secure Digital Input Output
USB	Universal Serial Bus
SATA	Serial AT Attachment: serial-interface standard for hard disks
HDA	High Definition Audio
S/PDIF	Sony/Philips Digital Interconnect Format
HDMI	High Definition Multimedia Interface
TMDS	Transition Minimized Differential Signaling
DVI	Digital Visual Interface
LPC	Low Pin-Count
I²C Bus	Inter-Integrated Circuit Bus
SM Bus	System Management Bus
SPI	Serial Peripheral Interface
GbE	Gigabit Ethernet
LVDS	Low-Voltage Differential Signaling
DDC	Display Data Channel
PN	Part Number - the part number for placing orders.
N.C	Not connected
N.A	Not available
T.B.D	To be determined

Contents

List of Tables

1 Introduction

1.1 Mini-ITX Concept

The Mini-ITX form factor provides enthusiasts and manufacturers with a standardized ultra compact platform for development. With a footprint of 170 mm x170 mm, this scalable platform promotes the design of highly integrated, energy efficient systems. Due to its small size, the Mini-ITX form factor enables PC appliance designers not only to design attractive low cost devices but also allows them to explore a huge variety of product development options - from compact space-saving designs to fully functional Information Station and Value PC systems. This helps to reduce product design cycle and encourages rapid innovation in system design, to meet the ever-changing needs of the market.

Additionally, the boards can also be passively cooled, presenting opportunities for fanless designs. The Mini-ITX boards are equipped with various interfaces such as PCI Express, SATA, USB 2.0/3.0, Ethernet, Displays and Audio.

1.2 conga-IC175

The conga-IC175 is a Single Board Computer designed based on the Thin Mini-ITX specification. The conga-IC175 SBC features the 7th Generation Intel Core U-Series processors. With 15W base TDP, the SBC offers Ultra Low Power boards with high computing performance and outstanding graphics. Additionally, the SBC supports dual channel DDR4 up to 2133 MT/s for a maximum system memory capacity of 32 GB, multiple I/O interfaces, up to three independent displays and various congatec embedded features.

With smaller board size and lower height keep-out zones, the conga-IC175 SBC provides manufacturers and system designers with the opportunity to design compact systems for space restricted areas. With appropriate I/O shield, the same conga-IC175 SBC can be used in either a Thin Mini-ITX or a Mini-ITX design.

The various features and capabilities offered by the conga-IC175 makes it ideal for the design of compact, energy efficient, performance-oriented embedded systems.

1.2.1 Options Information

The conga-IC175 is currently available in four variants. This user's guide describes all of these variants. The table below show the different configurations available. Check for the part number that applies to your product. This will tell you what options described in this user's guide are available on your particular module

Table 1   conga-IC175 Variants

Part-No.	052900	052901	052902	052903
Processor	Intel® Core™ i5-7300U 2.6 GHz Dual Core™	Intel® Core™ i3-7100U 2.4 GHz Dual Core™	Intel® Celeron® 3965U 2.2 GHz Dual Core	Intel® Core™ i7-7600U 2.8 GHz Dual Core™
Intel® Smart Cache	3 MB	3 MB	2 MB	4 MB
Max. Turbo Frequency	3.5 GHz	N.A	N.A	3.9 GHz
Processor Graphics	Intel® HD Graphics 620 (GT2)	Intel® HD Graphics 620 (GT2)	Intel® HD Graphics 610 (GT1)	Intel® HD Graphics 620 (GT2)
Graphics Max. Dynamic Freq	1.1 GHz	1.0 GHz	0.9 GHz	1.1 GHz
Memory (DDR4)	2133 MT/s dual channel	2133 MT/s dual channel	2133 MT/s dual channel	2133 MT/s dual channel
LVDS	Yes	Yes	Yes	Yes
DisplayPort (DP)	Yes	Yes	Yes	Yes
HDMI	Yes	Yes	Yes	Yes
Processor TDP (cTDP)	15 (7.5) W	15 (7.5) W	15 (10) W	15 (7.5) W

1.2.2 Optional Accessories

Table 2   Cooling/IO Shield

Accessories	Part No.	Description
conga-IC97/CSA	052252	12 V active cooling solution with Thin Mini-ITX height (compatible with conga-IC175)
conga-IC97/Retention Frame	052254	Retention frame for conga-IC97/CSA (compatible with conga-IC175)
conga-IC97/CSP	052260	Passive cooling solution with Thin Mini-ITX height (compatible with conga-IC175)
conga-IC170 IO Shield - Standard Size	052751	IO shield for conga-IC175 Mini-ITX height
conga-IC170 IO Shield - Thin Size	052752	IO shield for conga-IC175 with Thin Mini-ITX height

Table 3   Memory Modules

Memory Modules	Part No.	Description
DDR4-SODIMM-2400 (4GB)	068790	Certified 4 GB DDR4 SODIMM memory module with 2400 MT/s
DDR4-SODIMM-2400 (8GB)	068791	Certified 8 GB DDR4 SODIMM memory module with 2400 MT/s
DDR4-SODIMM-2400 (16GB)	068792	Certified 16 GB DDR4 SODIMM memory module with 2400 MT/s

Table 4   Cables

Cables	Part No.	Description
cab-ThinMini-ITX-SATA-Power	14000120	Power cable for SATA and micro-SATA devices.
cab-ThinMini-ITX-UART	14000121	UART cable with 2 x 5-pin female housing and D-Sub male connector.
cab-ThinMini-ITX-USB2.0-Single	14000122	USB 2.0 cable with 1 x 5-pin female housing and USB 2.0 Type A female connector.
cab-ThinMini-ITX-USB2.0-Twin	14000123	USB 2.0 cable with twin USB 2.0 Type A female connector and 2x5-pin housing.
cab-ThinMini-ITX-LVDS-Open End	14000125	ACES 40 pin-LVDS cable with open end.
cab-ThinMini-ITX-BKLT	14000127	CHYAO SHIUNN 8-pin backlight cable with open end.
cab-DP to HDMI Passive	14000128	
cab-ThinMini-ITX-LVDS	14000129	ACES 50204-40 LVDS cable for Thin Mini-ITX.
cab-ThinMini-ITX-SATA-Power (50cm lenght)	14000135	50 cm SATA power cable with 2 x 15-pin female connectors.
cab-ThinMini-ITX-SATA-Power (30cm length)	14000136	30 cm SATA power cable with 2 x 15-pin female connectors.
SATA III cable (straight/straight)	48000029	30 cm SATA III data cable with straight connectors at both ends
SATA III cable (straight/right-angled)	48000030	30 cm SATA III data cable with straight/right-angled connectors

Table 5   Adapters

Adapters	Part No.	Description
conga-Thin MITX/eDP to DP adapter	052231	eDP to standard DP evaluation adapter
conga-Thin MITX/eDP to HDMI adapter	052232	eDP to standard HDMI evalutiona adapter
conga-Thin MITX/LVDS Adapter	052233	LVDS pin header evaluation adapter for congatec Thin Mini-ITX boards
conga-Thin MITX/Debug Card	047858	Evaluation debug card with post code display, buttons, status LED's and other useful IO's
conga-DP2VGA	011132	DP/eDP to VGA adapter

Table 6   Power Supply

PSUs	Part No.	Description
NB Power Supply (65W, 19V@3.42A)	10000145	FSP065-REBN2, Plug 7.4 x 5.1 x 12.5 mm
NB Power Supply (90W, 19V@4.74A)	10000146	FSP090-DIEBN2, Plug 7.4 x 5.1 x 12.5 mm

Table 7   2.5-inch SSDs

2.5-inch SSDs	Part No.	Description
2.5" SSD, 120 GB SATA III – Intel® SSD Pro 5400s series	10000201	SATA III (6 Gbps), 16 nm, TLC, 0°C to 70°C
2.5" SSD, 180 GB SATA III – Intel® SSD Pro 5400s series	10000202	SATA III (6 Gbps), 16 nm, TLC, 0°C to 70°C
2.5" SSD, 240 GB SATA III – Intel® SSD Pro 5400s series	10000203	SATA III (6 Gbps), 16 nm, TLC, 0°C to 70°C
2.5" SSD, 360 GB SATA III – Intel® SSD Pro 5400s series	10000204	SATA III (6 Gbps), 16 nm, TLC, 0°C to 70°C
2.5" SSD, 128 GB SATA III – Innodisk 3ME3 series	10000205	SATA III (6 Gbps), 15 nm, MLC, 0°C to 70°C
2.5" SSD, 256 GB SATA III – Innodisk 3ME3 series	10000206	SATA III (6 Gbps), 15 nm, MLC, 0°C to 70°C

2 Specification

2.1 Feature List

Table 8   Feature Summary

Form Factor	Based on Thin Mini-ITX form factor (170 x 170 mm).
Processor	7th Generation Intel® Core™ i7,i5, i3 and Celeron Single Chip Ultra Low TDP Processors
Memory	Two memory sockets (located on the top side of the conga-IC175). Supports - SO-DIMM non-ECC DDR4 modules - Data rates up to 2133 MT/s - Maximum 32 GB capacity (16 GB each)
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
Chipset	Intel® 100 Series PCH-LP integrated in the Multi-Chip Package
Audio	Realtek ALC888S-VD 7.1 channel High Definition Audio codec
Ethernet	2x Gigabit Ethernet support via the onboard Intel® I219LM GbE PHY (with AMT 11 support) and Intel® I211 GbE controller.
Graphic Interfaces	Next Generation Intel® HD (610/620). Supports: - API (DirectX 12, OpenGL 5.0, OpenCL 2.1) - Intel® QuickSync & Clear Video Technology HD (hardware accelerated video decode/encode/processing/transcode) - Hybrid graphics - Up to 3 independent displays (must be two DDI's (DP, HDMI/DVI) and one eDP/LVDS)
	2x DP++ 1x LVDS/eDP
Back Panel I/O Connectors	2x DisplayPort++ (DP, HDMI,DVI) 2x Gigabit Ethernet (only connector X5 supports AMT) 1x Mic IN 4x USB 3.0 (supports also USB 2.0 devices) 1x Line OUT 1x DC-IN
Onboard I/O Connectors	4x USB 2.0 1x MIPI-CSI (camera interface) SATA Interfaces: 1x Integrated Sensor Hub (ISH) header - 2x Standard SATA 3.0 1x Internal power connector (12-24V) - 1x M.2 SATA SSD slot 1x Surround - 1x SATA power header connector (3.3V, 5V or 12V) 1x Front Panel HD Audio PCI Express Interfaces: 1x SPDIF out or Digital MIC - 1x PCIe x4 slot (Gen. 3) 1x Stereo speaker - 1x M.2 slot (type 3042/2242, key B) Super IO - 1x Full/half size mini PCIe (x1 lane) - 2x COM ports (COM 2 can be used optionally as ccTALK) 1x LVDS (top side) - 1x CPU fan with selectable voltage 1x Backlight - 1x System fan with selectable voltage 1x Monitor OFF - GPOs on feature connector 1x eDP interface (bottom side) Feature Connector (GPIOs, SPI, SMB, LPC, LID/SLEEP etc) 1x Micro-SIM card slot 1x Front panel header (power button, reset, LEDs) 1x Micro-SD card slot (bottom side) 1x Intrusion detection header (case open)

Optional Onboard Interfaces	1x SBM³ support header 1x SBM³ power 1x CEC header 1x ccTalk
Other Features	Thermal and voltage monitoring CMOS Battery Beeper congatec standard BIOS (also possible to boot from an external BIOS by triggering the BIOS_DISABLE# signal on the feature connector)
BIOS	AMI Aptio® UEFI 5.x firmware, 8/16 MByte serial SPI with congatec Embedded BIOS features.
Power Management	ACPI 4.0 compliant with battery support. Also supports Suspend to RAM (S3) and Intel AMT 9.5/10. Configurable TDP Ultra low standby power consumption, deep sleep.
Security	Optional discrete TPM 2.0; new AES Instructions for faster and better encryption.

Note

Some of the features mentioned in the above feature summary are optional. Check the part number of your SBC and compare it to the option information list on page 11 to determine what options are available on your particular SBC.

2.2 Supported Operating Systems

The conga-IC175 supports the following operating systems.

- Microsoft® Windows® 10

- Linux 3.x/4.x

Note

The Intel® Kaby Lake SoC supports only 64-bit operating systems.

2.3 Mechanical Dimensions

- 170 mm x 170 mm

- Height approximately 20 mm

2.4 Supply Voltage Power

- 12 – 24V DC ± 5 %

2.5 Power Consumption

The power consumption values were measured using the following test setup:

- Input voltage +12V
- conga-IC175 SBC
- conga-IC175 cooling solution
- Microsoft Windows 10 (64 bit)

Note

The CPU was stressed to its maximum workload with the Intel® Thermal Analysis Tool.

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

Table 9   Measurement Description

System State	Description	Comment
S0: Minimum value	Lowest frequency mode (LFM) with minimum core voltage during desktop idle.	The CPU was stressed to its maximum frequency.
S0: Maximum value	Highest frequency mode (HFM/Turbo Boost).	The CPU was stressed to its maximum frequency.
S0: Peak current	Highest current spike during the measurement of "S0: Maximum value". This state shows the peak value during runtime	Consider this value when designing the system's power supply, to ensure sufficient power is supplied during worst case scenarios.
S3	SBC is powered by 12V.	
S5	SBC is powered by 12V.	

Note

1. *The fan and SATA drives were powered externally.*

2. *All other peripherals except the LCD monitor were disconnected before measurement.*

Table 10   Power Consumption Values

The tables below provide additional information about the power consumption data for each of the conga-IC175 variants offered. The values are recorded at various operating mode.

Part No.	Memory Size	H.W Rev.	BIOS Rev.	OS (64 bit)	CPU			Current (Amp.)				
					Variant	Cores	Freq. /Max. Turbo	S0: Min	S0: Max	S0: Peak	S3	S5
052900	2 x 4 GB	B.0	R000	Windows 10	Intel® Core™ i5-7300U	2	2.6 /3.0 GHz	TBD	TBD	TBD	TBD	TBD
052901	2 x 4 GB	B.0	R000	Windows 10	Intel® Core™ i3-7100U	2	2.4 GHz/N.A	TBD	TBD	TBD	TBD	TBD
052902	2 x 4 GB	B.0	R000	Windows 10	Intel® Celeron® 3965U	2	2.2 Ghz /N.A	TBD	TBD	TBD	TBD	TBD
052903	2 x 4 GB	B.0	R000	Windows 10	Intel® Core™ i7-7100U	2	2.8 /3.9 GHz	TBD	TBD	TBD	TBD	TBD

Note

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

2.6   Supply Voltage Battery Power

Table 11   CMOS Battery Power Consumption

RTC @	Voltage	Current
-10ºC	3V DC	TBD µA
20ºC	3V DC	TBD µA
70ºC	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 also 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 AG website at www.congatec.com/support/application-notes.*

2.7 Environmental Specifications

Temperature	Operation: 0° to 60°C	Storage: -20° to +70°C
Humidity	Operation: 10% to 90%	Storage: 5% to 95%

Note

The above operating temperatures must be strictly adhered to at all times. Humidity specifications are for non-condensing conditions.

3   Block Diagram

PCIe x4

DP++

DP++

PCIe 1 - PCIe 4

PCIe 12 / SATA 2 *²

PCIe 11

USB 2.0

PCIe 9

USB 2.0

M.2 Slot (WWAN or SSD)

PCIe Mini Card (Full / Half Lenght)

micro-SIM card

optional

Intel® ULT SOC (CPU + PCH)

7th Generation Intel® Core™ Processor

Turbo Boost 2.0 Technology

| HT Technology | 64 Architecture | AMT 11 |
| SSE4.2 | TXT | AES-NI | TSX | VT | AVX2 |

Integrated Intel HD Graphics

Digital Display Interfaces

| DisplayPort 1.2 | HDMI 2.0 (3D, 4k) |

Hardware Graphics Accelerators

| 3D | Vector Graphics |
| 2D | DXVA |

Video Codecs	APIs
MPEG-2	OpenCL 2.0
H.265	OpenGL 5.0
WMV9	DirectX 12

Low Power Interconnect

Intel® 100 Series PCH-LP

High Definition Audio

ASRC

I/O Interfaces

| PCIe | LPC Bus | GPIOs |
| SATA | USB 2.0 | USB 3.0 |

2x Dual USB 2.0

4x USB3.0

USB2.0/USB3.0

microSD card

Ethernet — i219 — PCIe 5

Ethernet — i211-AT — PCIe 6

eDP — eDP

LVDS — 2x24 bit LVDS — **eDP to LVDS**

Backlight

Line OUT

Mic IN

Front Panel HD Audio

S/PDIF or DMIC

Internal speaker

Surround

Buzzer

Audio ALC888S

Speaker

HDA

Power IN — SBM³ Batery Mgmt *¹

Power IN

SATA 0

SATA 1

SATA 2 *¹ *²

SATA Power

SPI

Flash

Front Panel

TPM (optional)

congatec Board Controller

LPC

Feature *³

Super IO

FAN 1

FAN 2

COM 1

COM 2

ccTALK *¹

MIPI-CSI

Sensor Hub

2x SO-DIMM DDR4

External I/O   Internal I/O

*¹⁾ Optional feature (available with a customized variant)

*²⁾ Connected either to a standard SATA connector or to an M.2 slot.

*³⁾ Supports GPIOs, SPI, SMBus, LPC, UART, I2C, Sleep, LID, Watchdog

4   Cooling Solution

The conga-IC175 SBC offers Ultra Low Power boards with high computing performance and outstanding graphics. Due to its low power consumption, the SBC generates less heat and therefore requires less active cooling, allowing the use of quieter, lower profile coolers that are better suited to small form factor systems.

Nonetheless, all electronics contain semiconductor devices which have operating temperature ranges that should be adhered to. For this reason, it is imperative to provide sufficient air flow to each of the components, to ensure the specified operating temperature of the conga-IC175 is maintained.

congatec AG offers two cooling possibilities for the conga-IC175:

- A customized active cooling solution (fan attached with heatsink) in combination with the conga-IC175 retention frame. This cooling solution is adapted to the Thin Mini-ITX height specification and features a Hi-Flow 225UT pressure sensitive, phase change thermal interface. The retention frame acts as a mounting backplate and also as board reinforcement to prevent PCB deformation. Refer to section 4.2 "Active Cooling Dimensions" for the dimensions of the active cooling solution.

- The use of a custom cooling solution in combination with the conga-IC175 retention frame.
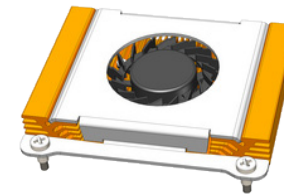
Retention Frame   Active Cooling Solution

Note

When a passive cooling is used, the end user must ensure that adequate air flow is maintained.

See section 1.2.2 "Optional Accessories/Cables" for the part numbers of the cooling accessories.

4.1   Cooling Installation

Assembly Instruction:

- Flip over the SBC and locate the position of the CPU

- Place retention frame on the bottom side of the board with insulating foil facing the PCB & standoffs inserted to mounting holes in PCB.

- Remove the protection pull tab foil from the phase changer and carefully place the cooling solution.

- Insert assembling screws.

- Slightly tighten each of the screws so that they hold the cooling solution in place. Start with one screw and then slightly tighten the other screws in a crossover pattern.

- Now you can fully tighten the screws. Once again, start with one and then continue to tighten the other screws in a crossover pattern.

- Connect the fan's power cable.

⚠ Caution

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.

For adequate heat dissipation, follow the assembly instruction above. Apply thread-locking fluid on the screws if the CSP is used in a high shock and/or vibration environment.

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

Also, do not exceed the maximum torque specification for the cooling solution screws. Doing so may damage the SBC.
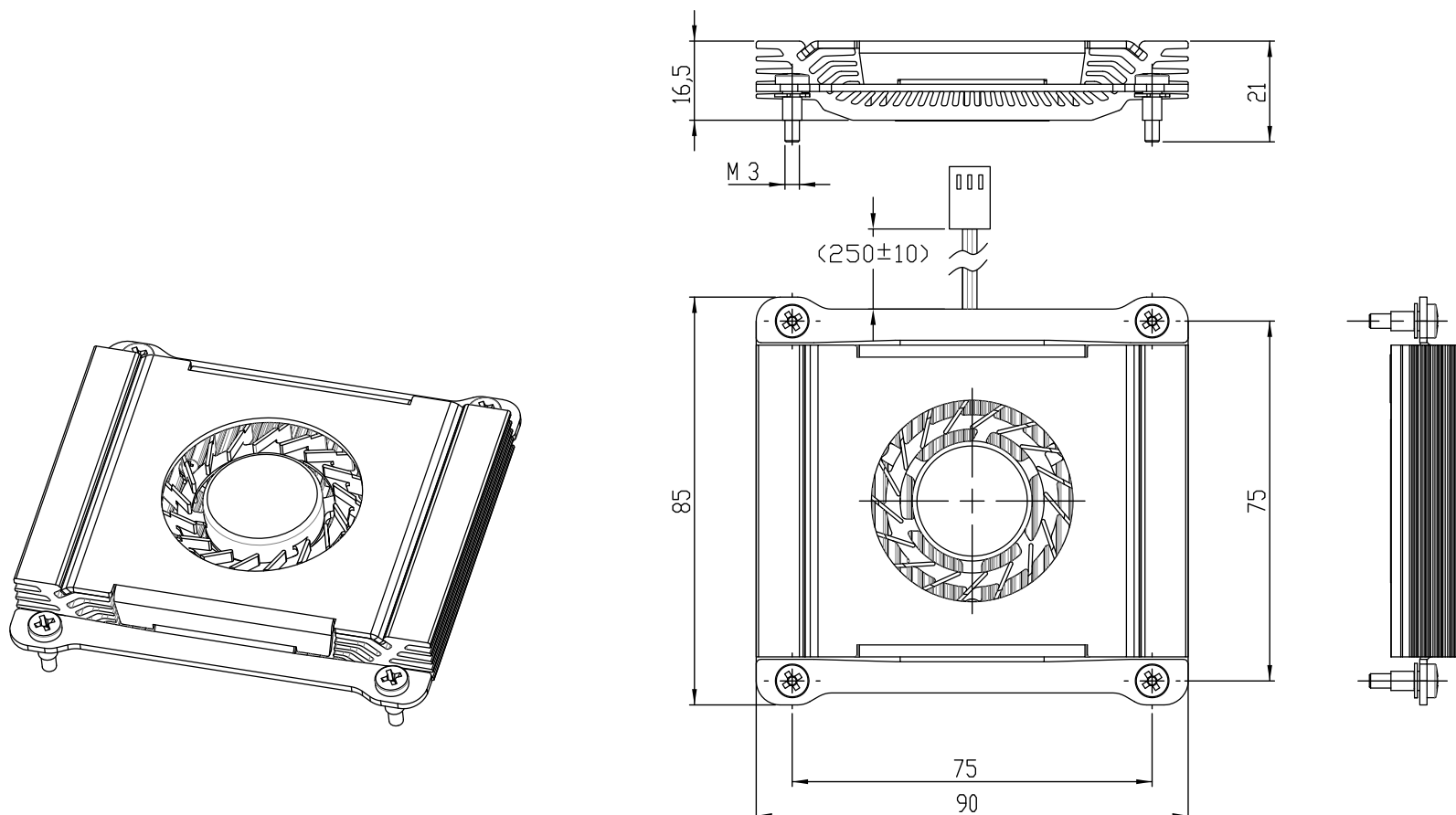
Note

All measurements are in millimeters. Torque specification for cooling solution screws is 0.6 Nm. Mechanical system assembly mounting shall follow the valid DIN/IS0 specifications.

To replace the fan, use equivalent fan with similar parameters.

5 Connector Description

5.1 Power Supply

You can power the conga-IC175 SBC with a 12V – 24V laptop type DC power supply (on connector X48) or a 4-pin internal power supply (on connector X49).

Additionally, the SBC offers an optional SBM[3] power connector (only BOM option). When this connector (X47) is populated, you can power the SBC with it.

Note

The supplied voltages must be within a tolerance of ± 5%.

5.1.1 DC Power Jack (Rear I/O)

You can power the conga-IC175 SBC with a laptop-type DC power supply, connected to the DC power jack on the back panel. The power input protects against polarity reversal and under/over voltage.

Table 12   Connector X48 Pinout Description

Pin	Function
Inner Shell	+12 - 24V
Outer Shell	GND

Connector Type

X48 : DC power jack, 7.4 x 5.1 mm diameter

DC Power Jack - Connector X48

DC Plug

center — inner +
— outer

1 = + DC (12-24V)
2 = GND

12-24 V maximum
Plug: 7.4 x 5.0 mm

Note

The conga-IC175 turns on immediately you connect a power supply. To change this behavior, set the "Power Loss Control" in the BIOS Boot Settings Configuration menu to "Remain OFF".
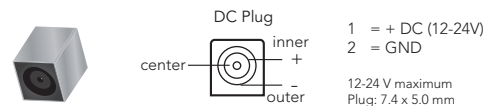
5.1.2   Power Supply (Internal Connector)

The conga-IC175 offers an internal 4-pin power connector. This connector makes it possible to use customized power supply cables or connectors. The power input protects against under voltage or over voltage.

Table 13   Connector X49 Pinout Description

Internal Power Connector X49

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	+12V - 24V	Power supply +12 - 24V
4	+12V - 24V	Power supply +12 - 24V
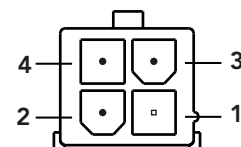
Connector Type

X49 : 2x2-pin, 4.2 mm pitch connector

Mating connector: Molex 87427-0442

Note

The conga-IC175 turns on immediately you connect a power supply. To change this behavior, set the "Power Loss Control" in the BIOS Boot Settings Configuration menu to "Remain OFF".

5.1.3   Optional SBM³ Power Connector (Internal Connector)

You can also power the conga-IC175 SBC optionally (BOM option) with an SBM battery kit. This option requires:

- Connector X47 - SBM battery power connector
- Connector X46 - SBM battery signals connector

Table 14   Connector X47 Pinout Description

SBM3 Power - Connector X47

Pin	Function
1	+12 - 24V
2	+12 - 24V
3	GND
4	GND
5	N.C

Connector Type

X47 : 1x5-pin, 3 mm pitch Molex Micro-FIT connector
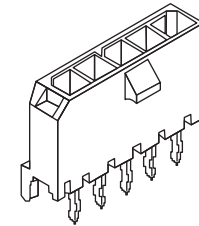
5.1.3.1   Optional SBM3 Signal Connector

As mentioned in section 5.1.3, you need the optional power connector X47 and the signal connector X47 for designs with SBM battery kit. The signal connector ensures the conga-IC175 communicates flawlessly with the battery kit.

Table 15   Connector X46 Pinout Description

SBM3 Signal - Connector X46

Pin	Function
1	GND
2	I2C_DAT
3	I2C_CLK
4	BATLOW#
5	SUS_STAT#
6	PM_SLP_S3#
7	PM_SLP_S4#
8	PWRBTN#

Connector Type

X46 : 8-pin, 1.25 mm pitch Molex PicoBlade connector
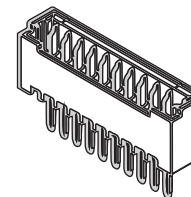
5.1.4 Power Status LEDs

The conga-IC175 provides two LED signals (FP_LED+ and P_LED-) on pins 2 and 4 of the front panel connector X39. The signals indicate the different power states of the conga-IC175.

Table 16   LED States

State	FP_LED+	FP_LED-
S0	1	0
S3	0	1
S5	0	0

Note

For the front panel pinout description, see section 6.1 "Front Panel Connector".

5.2 CMOS Battery/RTC

The conga-IC175 provides a board-mounted battery holder (M60) for CMOS battery. The CMOS battery supplies the necessary power required to maintain the CMOS settings and configuration data in the UEFI flash chip. The specified battery type is CR2032

The conga-IC175 offers an optional connector (X44) for external CMOS battery. .

M60 (Battery Holder)

Optional connector X44
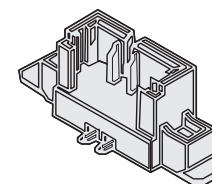
Connector Type

X44 : 2-pin, 1.25mm pitch Molex PicoBlade header

Warning

Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

5.3 Audio Interface

The conga-IC175 provides audio connectors internally and on the rear side. The internal audio connectors are stereo speaker, digital microphone/SPDIF and front Panel HD audio. The rear audio connectors are Line-OUT and Mic-IN.

5.3.1 Rear Audio Connectors

The conga-IC175 has a high definition audio codec (Realtek ALC888S) mounted on it. The line output signals and the MIC signals are routed to connectors X31 (Line-OUT) and X29 (MIC-IN) on the rear side respectively. You can find the drivers for this codec at:

http://www.congatec.com/en/products/mini-itx-single-board-computer/conga-ic175.html

Table 17   MIC-IN (Connector X29) Pinout Description

Pin	Jack	Signal	Description
1	Tip	MIC1_L	Microphone - left channel
2	Ring	MIC1_R	Microphone - right channel
3	Sleeve	A_GND	Analog ground

MIC IN - Connector X29   **Jack (MIC-IN)**

Tip
Ring
Sleeve
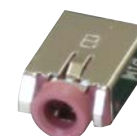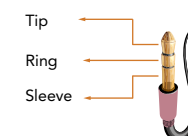
Table 18   Line-OUT (Connector X31) Pinout Description

Pin	Jack	Signal	Description
1	Tip	LINE_L	Line-OUT - left channel
2	Ring	LINE_R	Line-OUT - right channel
3	Sleeve	A_GND	Analog ground
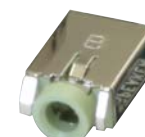
Connector Type

X29, X31: 3-pin, 3.5 mm single audio jack

Line OUT - Connector X31   **Jack (Line-IN)**

Tip
Ring
Sleeve

5.3.2 Internal Audio Connectors

The conga-IC175 provides the stereo speaker, digital microphone/SPDIF, front panel HD and surround audio connectors internally.

5.3.2.1 Stereo Speaker Header

The first analog line input channels (left and right) of the Realtek ALC888S HDA audio codec are routed to connector X30, via a TPA2012D2 amplifier. The amplifier offers a maximum wattage of 2.1W per channel into 4 ohms.

Table 19   Stereo Speaker (Connector X30) Pinout Description

Stereo Speaker - Connector X30

Pin	Signal	Description
1	FRONT_L-	Analog front left (differential negative)
2	FRONT_L+	Analog front left (differential positive)
3	FRONT_R+	Analog front right (differential positive)
4	FRONT_R-	Analog front right (differential negative)

Connector Type

X30: 2 mm, 4-pin crimp style connector

Mating connector: Chyao Shiunn JS-1124-04
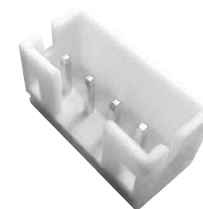
5.3.2.2 Digital Microphone/SPDIF

The Digital Microphone/SPDIF signals of the Realtek ALC888S HDA audio codec are routed to the internal digital microphone/SPDIF connector X28. This connector offers two power supply pins (3,3V and 5V). Power Budget of these pins is limited to 500mA.

Internal Digital Microphone/SPDIF (Connector X28) Pinout Description

Digital MIC/SPDIF - Connector X28

Pin	Signal	Description
1	+3.3V	3.3V supply
2	DMIC_DATA	Serial data from digital MIC
3	GND	Ground
4	SPDIFO2/DMIC_CLK	S/PDIF output or Digital MIC serial clock (configurable)
5	KEY	No pin
6	+5V	5V supply
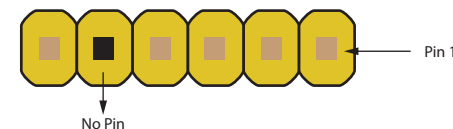
⊞ Connector Type

X28: 2.54 mm, 1x6-pin header

5.3.2.3 Front Panel (HD Audio/AC97)

The front panel HD audio signals of the Realtek ALC888S HDA audio codec are routed to connector X27. The pinout description of the connector is shown below:

Table 20   HDA/AC97 Front Panel (Connector X27) Pinout Description

Pin	Signal	Description
1	MIC2_L	2nd analog stereo microphone input - left channel
2	GND_HDA	Audio ground
3	MIC2_R	2nd analog stereo microphone input - right channel
4	PRESENCE#	Active low signal that indicates that an Intel HD Audio dongle is connected to the analog header.
5	LINE2_R	2nd analog line output - right channel (headphone)
6	MIC2_JD	Microphone jack detection
7	SENSE	Jack detection for HDA codec
8	KEY	No pin
9	LINE2_L	2nd analog line output - left channel (headphone)
10	LINE2_JD	Line output jack detection

⊞ Connector Type

X27: 2.54 mm, 2x5-pin header

Front Panel Audio - Connector X27

No Pin

Pin 10

Pin 1
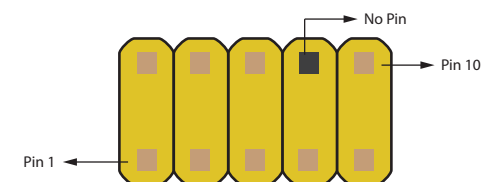
5.3.2.4 Surround header

The surround signals of the Realtek ALC888S HDA audio codec are routed to the internal surround connector.

Table 21   Surround (Connector X26) Pinout Description

Pin	Signal	Description	Pin	Signal	Description
1	LINE1_L	1st Analog line input left channel	2	A_GND	Analog ground
3	A_GND	Analog ground	4	LINE1_R	1st Analog line input right channel
5	SIDE_L	Analog side output left channel	6	A_GND	Analog ground
7	A_GND	Analog ground	8	SIDE_R	Analog side out right channel
9	SURR_L	Analog surround out left channel	10	A_GND	Analog ground
11	A_GND	Analog ground	12	SURR_R	Analog surround out right channel
13	CENTER	Analog center output	14	A_GND	Analog ground
15	A_GND	Analog ground	16	LFE	Analog low frequency output
17	-	No pin	18	SENSE	Jack detection for HDA codec

Surround - Connector X26
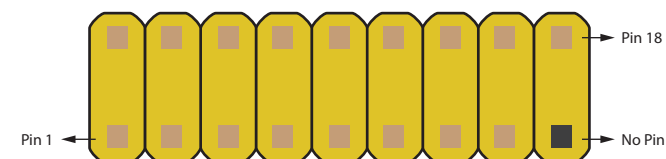
Connector Type

X26: 2 mm, 2x9-pin header

5.4 Communication Bus

The conga-IC175 supports both SMBus and I2C compliant devices.

5.4.1 SMBus

The SMBus signals are available in different locations on the conga-IC175, including the feature connector (X38) described in section 6.13.

5.4.2 SPI Bus

The SPI signals are connected to the onboard SPI flash and the feature connector (X38). With the SPI signals on the feature connector, you can start the conga-IC175 from an external flash. This however requires a customized adapter to trigger the BIOS_DISABLE# signal (pin 46) of the feature connector.

Note

The congatec customized adapter for the feature connector is for internal use only.

5.4.3　I²C Bus

The congatec board controller provides I²C signals. These signals are available in different locations on the conga-IC175, including the feature connector (X38) described in section 6.13 of this document.

5.5　LPC Super I/O Device

The conga-IC175 has an onboard Super I/O controller. The controller is connected to the SoC's LPC bus and provides additional interfaces such as two serial interfaces, optional ccTALK, GPOs, 4-wire CPU and system fans. .

5.5.1　GPIOs

The conga-IC175 SBC provides eight General Purpose Inputs via the congatec board controller and eight General Purpose Outputs via the onboard Super I/O. The GPIO signals are routed to the feature connector (X38) described in section 6.13 "Feature Connector".

5.5.2　Serial Ports (COM)

The Super I/O controller on the conga-IC175 provides two fully featured RS-232 compliant UART interfaces (COM 1 and 2). The COM ports support data rates up to 250 kbps with worst-case loads of 3kΩ, in parallel with 1nF.

Table 22　Serial Ports (Connectors X34/X37) Pinout Description

COM 1 & 2 - Connectors X34/X37

Pin	Signal	Description	Pin	Signal	Description
1	DCD	Data Carrier Detect	2	RXD	Received Data
3	TXD	Transmit Data	4	DTR	Data Terminal Ready
5	GND	Ground	6	DSR	Data Set Ready
7	RTS	Request to Send	8	CTS	Clear to Send
9	RI	Ring Indicator	10	N.C	Not connected
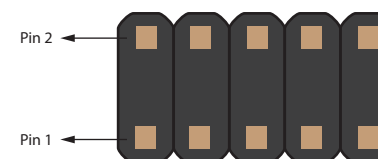
Connector Type

X34,X37: 2.54 mm, 2x5-pin headers

Note

The conga-IC175 offers an optional ccTALK interface. This interface uses transmit and receive signals of COM 2. If this option is implemented, COM 2 will not be available.

5.5.3 CPU/System Fan Connector & Power Configuration

The conga-IC175 supports 5V or 12V CPU and system fans. The signals of the CPU and system fans are routed to connectors X33 and X36 respectively. Use jumper X32 to select the voltage of the CPU fan and jumper X35 to select the voltage of the system fan.

Table 23   CPU/SYS Fan Pinout

X33/X36 Pin	Signal
1	GND
2	VCC +5VDC/+12VDC
3	FAN_TACHOIN
4	FAN_CTRL

Jumper X32, X35	Configuration
1 - 2	FAN +12VDC (default)
2 - 3	FAN +5VDC

CPU Fan (X33)

1 2 3 4

1: GND
2: VCC +5VDC/+12VDC
3: FAN_TACHOIN
4. FAN_CTRL

SYS Fan (X36)

1 2 3 4

1: GND
2: VCC +5VDC/+12VDC
3: FAN_TACHOIN
4. FAN_CTRL

X32 X35

1
2
3
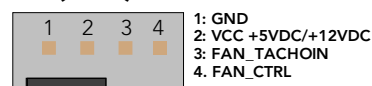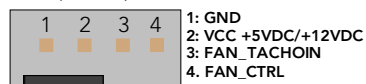
Connector Type

X33, X36: 2.54 mm, 4-pin grid female fan connector

X32, X35: 2.54 mm grid jumper

> **Note**
>
> *The maximum power of both CPU and SYS fan is 5 W.*

5.6 Universal Serial Bus (USB)

The conga-IC175 provides 10 USB ports - four on the rear connectors, four internally and two on the mini-PCIe and M.2 connectors.

5.6.1 Rear USB Connectors

The conga-IC175 offers four USB 3.0 ports (port 1-4) on the rear side. These ports are routed directly from the SoC to connectors X13 and X14. The ports support also USB 2.0 devices.
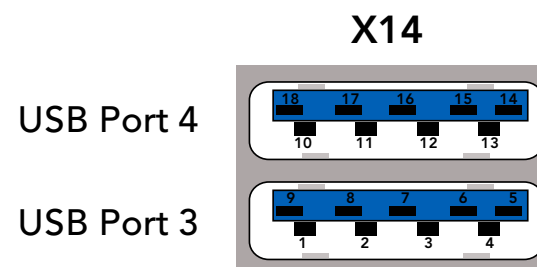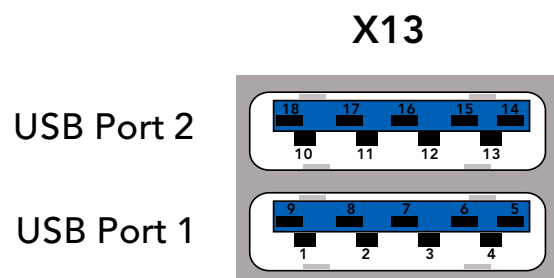
Connector Type

X13,X14: Dual USB 3.0 type A (stacked) connector

Note

The +5V signals of connector X13 and X14 have a maximum current of 1A each.

5.6.2   Internal USB Connectors

The conga-IC175 offers four USB ports (ports 7-10) internally. Ports 7 and 8 are routed to connector X16 while ports 9 and 10 are routed to connector X15.

Table 24   Connector X16 Pinout Description

Internal USB - Connector X16

USB Port 7			USB Port 8		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	2	+5V	+5V supply
3	USB7-	USB Port 7, Data-	4	USB8-	USB Port 8, Data-
5	USB7+	USB Port 7, Data+	6	USB8+	USB Port 8, Data+
7	GND	Ground	8	GND	Ground
9	No Pin	Empty	10	N.C	Not Connected

Note

Connector X16 supports Wake-on-USB feature.

Table 25   Connector X15 Pinout Description

Internal USB - Connector X15

USB Port 9			USB Port 10		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	2	+5V	+5V supply
3	USB9-	USB Port 9, Data-	4	USB10-	USB Port 10, Data-
5	USB9+	USB Port 9, Data+	6	USB10+	USB Port 10, Data+
7	GND	Ground	8	GND	Ground
9	No Pin	Empty	10	N.C	Not Connected

Connector Type

X15, X16: 2.54 mm, 2x5-pin header

Note

Each port (ports 7-10) has a maximum current of 0.5A.

congatec offers adapter cables for the Internal USB connectors (see section 1.2.2 "Optional Accessories/Cables). For more information, contact congatec technical solution department.
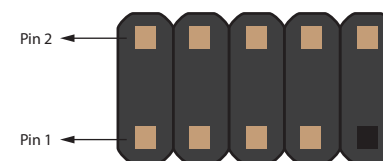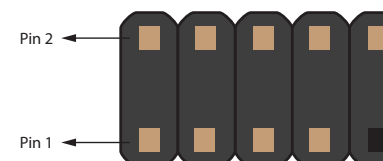
5.7   Ethernet 10/100/1000

The conga-IC175 provides two Gigabit Ethernet ports (connectors X5 and X6) on the rear side. Only the LAN interface on connector X5 supports Intel AMT technology.

Table 26   LED Description

LED Left Side	Description		LED Right Side	Description
Off	10 Mbps link speed		Off	No link
Green	100 Mbps link speed		Steady On	Link established, no activity detected
Orange	1000 Mbps link speed		Blinking	Link established, activity detected
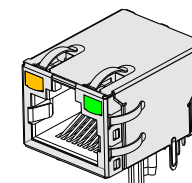
Connector Type

X5/X6: 8-pin RJ45 connector with gigabit magnetic and LEDs

5.8   SATA Interfaces

5.8.1   Standard SATA Ports

The conga-IC175 provides three SATA ports - two standard SATA connectors (X51 and X52) and one M.2 connector (X10). The SATA ports support data rates up to 6 Gbps.

When there is activity on any of the SATA interfaces, the SATA LED on the front panel connector (X39) glows.

SATA0 (X51)   SATA1 (X52)   Optional - SATA2 (X50)

1 2 3 4 5 6 7   1 2 3 4 5 6 7   1 2 3 4 5 6 7

Serial ATA Channel 0
Serial ATA Channel 1
Serial ATA Channel 2 (optional)
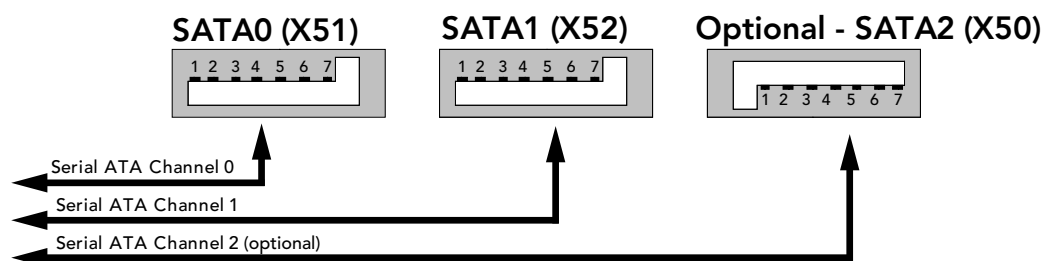
Connector Type

X50,X51,X52: Standard SATA connector

1. *The conga-IC175 offers an additional standard SATA connector (X50) via an assembly option (customized variant).*

2. *Connector X51 supports eSATA devices.*

3. *Connector X52 supports SATADOM devices on hardware revision A.x and later.*

5.8.2   SATA Power

The conga-IC175 provides an internal SATA power for hard drives on connector X12. This connector supplies 3.3V, 5V and 12V.

Table 27   Connector X12 Pinout Description.

SATA Power (X12)

Pin	Signal	Pin	Signal	Pin	Signal
1	+3.3V	6	GND	11	GND
2	+3.3V	7	+5V	12	GND
3	+3.3V	8	+5V	13	12V
4	GND	9	+5V	14	12V
5	GND	10	GND	15	12V
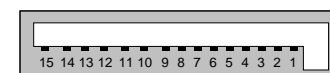
Connector Type

X12: 15-pin standard SATA power connector

⬡ **Note**

1. *Do not power more than two devices at the same time.*

2. *The +3.3V, +5V and +12V voltage rails have maximum current of 2 amps each.*

5.8.3 M.2 Slot

The conga-IC175 offers an M.2, type 3042/2242 slot (X10) for connecting SATA or PCIe x2 SSDs and WWAN devices.

Table 28   Connector X10 Pinout Description (Revision B.x and later)

Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V
3	GND	4	+3.3V
5	GND	6	FULL_CARD_PWROFF#
7	USB_D+	8	W_DISABLE_1#
9	USB_D-	10	LED1 (optional)
11	GND	12	
13		14	Key
15	Key	16	
17		18	
19		20	N.C
21	CONFIG_0	22	N.C
23	WoWWAN#	24	N.C
25	N.C	26	W_DISABLE_2#
27	GND	28	N.C
29	PER1-	30	UIM_RESET
31	PER1+	32	UIM_CLK
33	GND	34	UIM_DATA
35	PET1-	36	UIM_PWR
37	PET1+	38	DEVSLP
39	GND	40	GNSS_SCL
41	PER0-/SATA_B+	42	GNSS_SDA
43	PER0+/SATA_B-	44	GNSS_IRQ
45	GND	46	N.C
47	PET0-/SATA_A-	48	N.C
49	PET0+/SATA_A+	50	RESET#
51	GND	52	CLKREQ#
53	REFCLK-	54	PEWAKE#
55	REFCLK+	56	N.C

M.2 Type B Slot - Connector X10
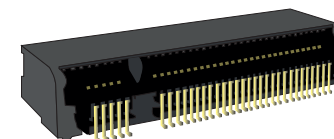
Pin	Signal	Pin	Signal
57	GND	58	N.C
59	N.C	60	N.C
61	N.C	62	N.C
63	N.C	64	N.C
65	N.C	66	N.C
67	RESET#	68	SUSCLK
69	CONFIG_1	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	CONFIG_2		

Connector Type

X10: M.2 type B slot (compatible with card size 3042 or 2242)

Note

1. *On hardware revision A.x and earlier, the M.2 slot supports SATA SSD and WWAN (USB 2.0) devices by default, and PCIe x1 devices via a customized BIOS.*

2. *Micro-SIM card slot (connector 11) is connected to the UIM Interface of the M.2 slot by default.*

5.9 Display Interfaces

The conga-IC175 supports up to three independent displays. The interfaces supported are two Digital Display Interfaces and one LVDS or eDP interface.

5.9.1 Display Port Interface DP++

The conga-IC175 SBC has two DP++ connectors (X18 and X19) located at the rear I/O panel. These connectors support DP/HDMI/DVI displays.

DP++ Connectors X18/X19
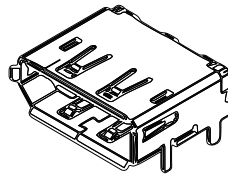
Connector Type

X18,X19: Standard DisplayPort connector

5.9.2 LVDS

The conga-IC175 offers LVDS interface on connector X25 – a 40-pin LVDS connector. The LVDS signals are sourced from incoming eDP stream, via a multiplexer. The multiplexer routes the eDP signals to LVDS connector X25 (via an eDP to LVDS bridge) by default.

The LVDS interface is found on the top side of the SBC and supports

- 24 bit single channel
- selectable backlight voltage
- VESA color mappings
- automatic panel detection
- resolution up to 1920 x 1200 in dual LVDS mode.

Table 29   Connector X25 Pinout Description

Pin	Signal	Pin	Signal
1	LVDS_A3+	21	N.C
2	LVDS_A3-	22	EDID_3.3V
3	LVDS_A2+	23	LCD_GND
4	LVDS_A2-	24	LCD_GND
5	LVDS_A1+	25	LCD_GND
6	LVDS_A1-	26	LVDS_A_CLK+
7	LVDS_A0+	27	LVDS_A_CLK-
8	LVDS_A0-	28	BKLT_GND
9	LVDS_B3+	29	BKLT_GND
10	LVDS_B3-	30	BKLT_GND
11	LVDS_B2+	31	EDID_CLK
12	LVDS_B2-	32	eDP_LVDS_BKLT_EN
13	LVDS_B1+	33	eDP_LVDS_BKLT_CTRL
14	LVDS_B1-	34	LVDS_B_CLK+
15	LVDS_B0+	35	LVDS_B_CLK-
16	LVDS_B0-	36	BKLT_PWR
17	EDID_GND	37	BKLT_PWR
18	LCD_VCC	38	BKLT_PWR
19	LCD_VCC	39	N.C
20	LCD_VCC	40	EDID_DATA

LVDS Connector X25
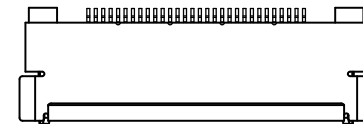
Connector Type

X25: 0.5 mm, 40-pin ACES connector

Mating connector: ACES 88441-40 or ACES 50204-40

Note

1. *The maximum output current for LCD and backlight power rails is 2A.*

2. *congatec offers cables and adapter for the LVDS interface (see section 1.2.2 "Optional Accessories/Cables"). For more information, contact congatec technical solution department.*

5.9.3 Embedded Display Port (eDP)

The conga-IC175 provides eDP interface on connector X20 - a standard 40-pin DisplayPort connector. The eDP signals are sourced from incoming eDP stream via a multiplexer. The multiplexer routes the eDP signals to LVDS connector X25 (via an eDP to LVDS bridge) by default. To route the eDP signals to eDP connector X20, change the 'Active LFP Configuration" in the BIOS setup menu to 'eDP'.

The eDP interface is found on the bottom side of the SBC.

Table 30   Connector X20 Pinout Description

Pin	Signal	Pin	Signal
1	N.C	21	VCC_LCD
2	GND	22	N.C
3	eDP_TX3-	23	GND
4	eDP_TX3+	24	GND
5	GND	25	GND
6	eDP_TX2-	26	GND
7	eDP_TX2+	27	eDP_HPD
8	GND	28	GND
9	eDP_TX1-	29	GND
10	eDP_TX1+	30	GND
11	GND	31	GND
12	eDP_TX0-	32	eDP_LVDS_BKLT_EN
13	eDP_TX0+	33	eDP_LVDS_BKLT_CTRL
14	GND	34	N.C
15	eDP_AUX+	35	N.C
16	eDP_AUX-	36	N.C
17	GND	37	BKLT_PWR
18	VCC_LCD	38	BKLT_PWR
19	VCC_LCD	39	BKLT_PWR
20	VCC_LCD	40	N.C

eDP Connector X20

Connector Type

X20: 0.5 mm, 40-pin ACES connector

Mating connector: ACES 88441-40 or ACES 50204-40

Note

congatec offers cables and adapter for the eDP interface (see section 1.2.2 "Optional Accessories/Cables"). For more information, contact the congatec technical solution department.

5.9.3.1 Backlight Power Connector

The conga-IC175 provides backlight power on connector X22.

Table 31   Connector X22 Pinout Description

Pin	Signal Name	Description
1	eDP_LVDS_BKLT_EN	Backlight enable
2	eDP_LVDS_BKLT_CTRL	Backlight control
3	BKLT_PWR	Backlight inverter power
4	BKLT_PWR	Backlight inverter power
5	GND	Backlight ground
6	GND	Backlight ground
7	Brightness_Up	Flat panel brightness increase
8	Brightness_Down	Flat panel brightness decrease

Backlight Power - Connector X22

Connector Type

X22: 2 mm, 8-pin crimp style connector

Mating connector: Chyao Shiunn JS-1124-08

Note

congatec offers an open-end cable for this interface (see section 1.2.2 "Optional Accessories/Cables"). For more information, contact the congatec technical solution department.
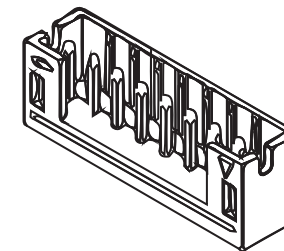
5.9.3.2 Backlight/Panel Power Selection

The conga-IC175 supports different voltages for the panel and backlight. With jumper X23, you can set the panel voltage to 3,3V, 5V or 12V. With jumper X24, you can set the backlight voltage to 5V or 12V.

Table 32   Connector X23 Pinout Description

Jumper Position	LCD Voltage
2-4	+3.3V
3-4	+12V
4-6	+5V

Table 33   Connector X24 Pinout Description

Jumper Position	Backlight Voltage
2-4	N.A
3-4	+12V
4-6	+5V

Connector Type

X23, X24: 2.54 mm, 2x3-pin header (without pins 1 and 5)

Panel Voltage Selector - Jumper X23

Pin 2   Pin 6
No Pin   No Pin
Default Settings: Pin 3
Pins 2 and 4
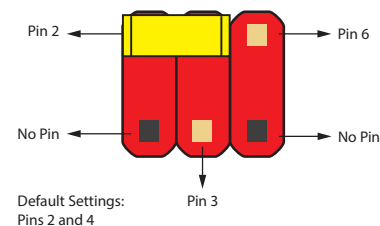
Backlight Voltage Selector - Jumper X24

Pin 2   Pin 6
No Pin   No Pin
Default Settings: Pin 3
Pins 3 and 4
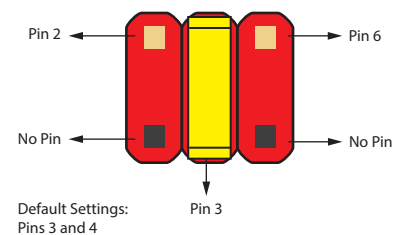
5.9.3.3 Monitor OFF connector

The monitor OFF connector X21 offers the possibility to switch off the displays attached to LVDS or eDP port.

Table 34   Connector X21 Pinout Description

Pin	Function
1	GND
2	MONITOR_OFF#

Connector Type

X21: 2.54 mm, 2-pin Molex KK series connector

Monitor OFF - Connector X21
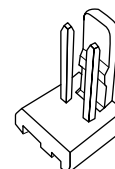
5.9.4   PCI Express

The conga-IC175 provides 3 PCIe interfaces - a PCIe M.2 slot on connector X10 (see section 5.8.3), a PCIe x4 slot on connector X7 and a full/half size mini PCIe slot on connector X8

5.9.4.1   PCIe x4 Slot

The conga-IC175 offers a PCIe x4 slot on connector X7.

Table 35   PCIe x4 Slot (Connector X7) Pinout Description

Pin	Signal	Pin	Signal
B1	+12V	A1	PRSNT1#
B2	+12V	A2	+12V
B3	+12V	A3	+12V
B4	GND	A4	GND
B5	SMB_CLK	A5	N.C
B6	SMB_DAT	A6	N.C
B7	GND	A7	N.C
B8	+3.3V	A8	N.C
B9	N.C	A9	+3.3V
B10	+3.3V Aux	A10	+3.3V
B11	WAKE#	A11	PCIE_RST#
	Key		
B12	N.C	A12	GND
B13	GND	A13	PCIE_CLK+
B14	PCIE_TX0+	A14	PCIE_CLK-
B15	PCIE_TX0-	A15	GND
B16	GND	A16	PCIE_RX0+
B17	PRSNT2#	A17	PCIE_RX0-
B18	GND	A18	GND
B19	PCIE_TX1+	A19	N.C
B20	PCIE_TX1-	A20	GND
B21	GND	A21	PCIE_RX1+

**PCIe Slot
(Connector X7)**

PCIe (x1, x2 or x4)
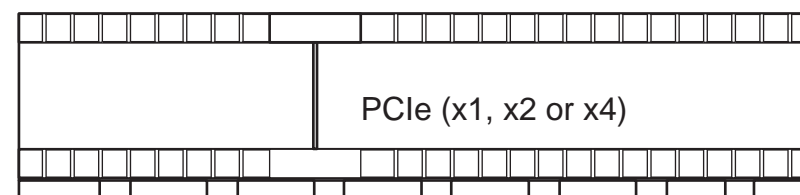
B22	GND	A22	PCIE_RX1-
B23	PCIE_TX2+	A23	GND
B24	PCIE_TX2-	A24	GND
B25	GND	A25	PCIE_RX2+
B26	GND	A26	PCIE_RX2-
B27	PCIE_TX3+	A27	GND
B28	PCIE_TX3-	A28	GND
B29	GND	A29	PCIE_RX3+
B30	N.C	A30	PCIE_RX3-
B31	PRSNT#2	A31	GND
B32	GND	A32	RSVD

Connector Type

X7: PCIe x4 connector

5.9.4.2   Full/half-size Mini PCIe

The conga-IC175 offers a mini PCIe socket on connector X8. This socket is optimized for mobile computing platforms and provides the ability to insert different removable mini PCIe cards. This approach makes it possible to upgrade standard PCIe mini card devices on the SBC, without extra cost of a redesign.

Table 36   mPCIe (Connector X8) Pinout Description

Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3V
3	N.C	4	GND
5	N.C	6	+1.5V
7	CLKREQ#	8	N.C *[1]
9	GND	10	N.C *[1]
11	REFCLK-	12	N.C *[1]
13	REFCLK+	14	N.C *[1]
15	GND	16	N.C
17	N.C	18	GND
19	N.C	20	W_DISABLE#

mPCIe Socket (Connector X8)

X8

M44

M45

M43
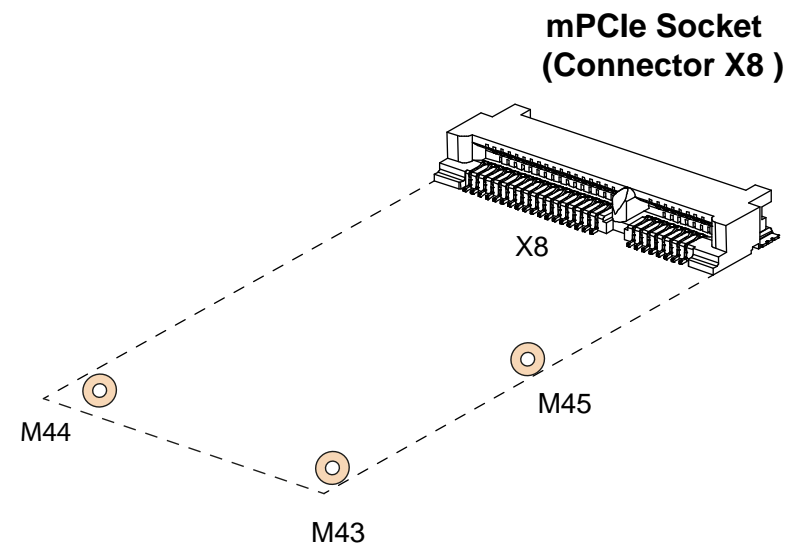
Pin	Signal	Pin	Signal
21	GND	22	PERST#
23	PERn0	24	+3.3V
25	PERp0	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	PETn0	32	SMB_DATA
33	PETp0	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	+3.3V	40	GND
41	+3.3V	42	N.C
43	GND	44	LED_WLAN# (optional)
45	CL_CLK	46	N.C
47	CL_DATA	48	+1.5V
49	CL_RST#	50	GND
51	N.C	52	+3.3V
53	GND	54	GND

Connector Type

X8: PCIe mini card socket

Note

*1 The micro-SIM card slot (connector X11) can optionally be connected to these pins (UIM interface).

The diagram below shows how the PCIe lanes are routed to the PCIe connectors.

PCIe x4
Slot 0

PCIe Lane1

PCIe Lane2

X7

PCIe Lane3

PCIe Lane4

PCIe Lane Mapping

Mini PCIe
Slot 1

PCIe Lane9

X8

USB 2.0 Signals

M.2 Connector
Slot 2

PCIe Lane11

PCIe Lane12 or SATA port 2

X10

USB 2.0 Signals
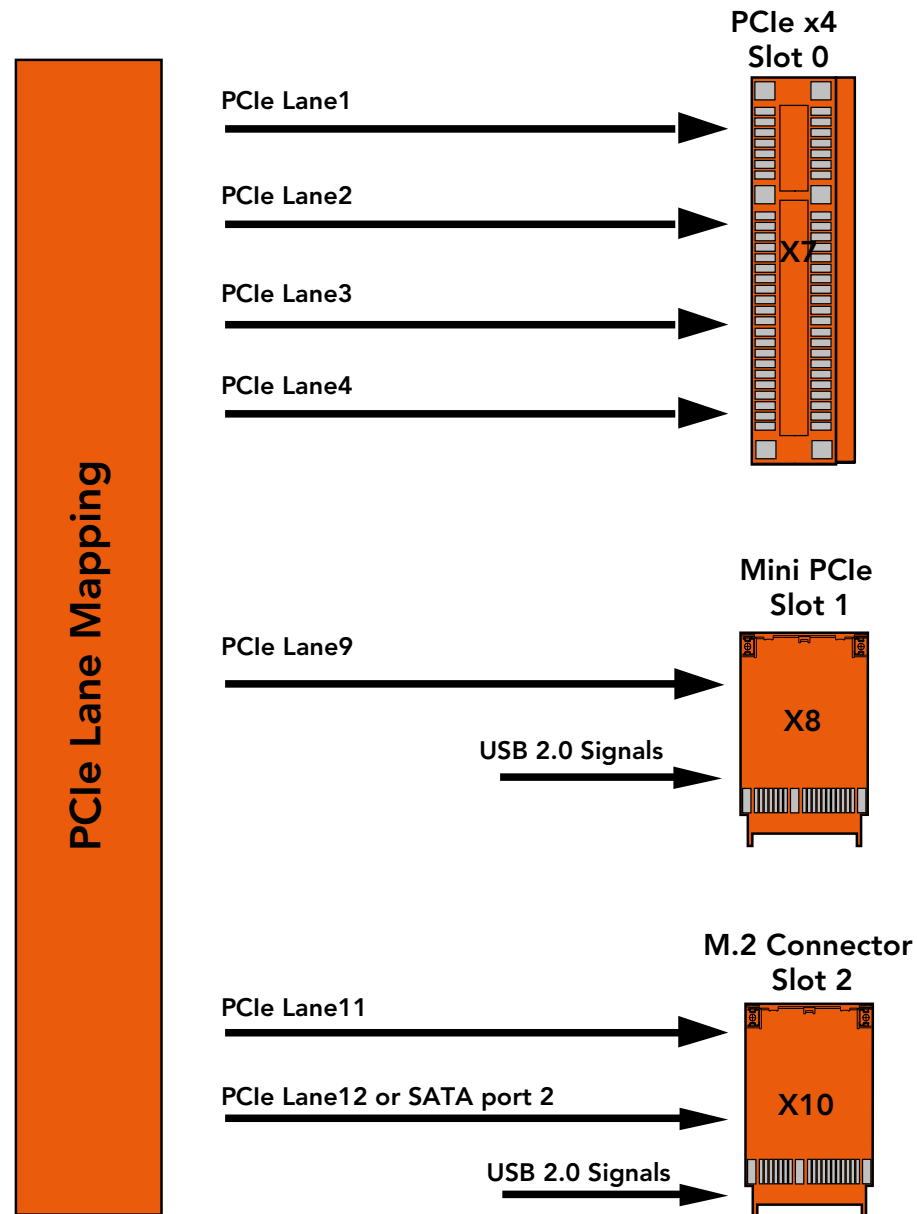
6 Additional Features

6.1 Front Panel Connector

The conga-IC175 SBC supports front panel features such as power button, status LEDs and reset button via connector X39 - a 10-pin internal header. The FP_LED+ and FP_LED- signals communicate the system states to two LEDs connected to this header. See section 5.1.5 "Power Status LED" for the possible power states and corresponding LED status.

Table 37   Front Panel (Connector X39) Pinout Description

Pin	Signal	Description
1	HDD_POWER_LED+	Hard disk activity LED (anode)
2	FP_LED+	Power LED (main color)
3	HDD_LED	Hard disk activity LED (cathode)
4	FP_LED-	Power LED (alternate color)
5	GND	Ground
6	PWRBTN#	Power Button
7	SYS_RST#	Reset Button
8	GND	Ground
9	+V5S	+5V power supply (500mA power budget)
10	KEY	No pin

Front Panel - Connector X39

Connector Type

X39: 2.54 mm,10-pin header

6.2 Micro-SIM Card

The conga-IC175 offers a micro-SIM slot on connector X11 for inserting SIM card.
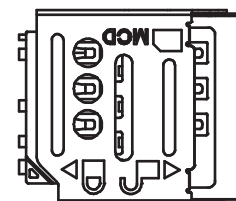
Table 38   Connector X11 Pinout Description

Pin	Signal	Description
C1	PWR	Power
C2	RST	Reset

SIM Slot - Connector X11

Pin	Signal	Description
C3	CLK	Clock
C4	N.A	Not available
C5	GND	Ground
C6	VPP	Programming voltage input
C7	I/O	Data
C8	N.A	Not available

Connector Type

X11: Micro-SIM card socket (Molex 78800 series)

Note

1. *The micro-SIM card slot is connected to the UIM interface of the M.2 slot by default.*

2. *The slot can optionally be connected to the UIM interface of the mPCIe slot.*

6.3   Micro-SD Card

The conga-IC175 offers a micro-SD slot on connector X60. The SD card slot complies with SDXC card specification 3.0 with support for up to 104 MBps data rate.

Table 39   Connector X60 Pinout Description

Pin	Signal	Description
1	SD_D2	Data line (bit 2)
2	SD_D3	Data line (bit 3)
3	SD_CMD	Command response
4	+3.3V	Supply voltage
5	SD_CLK	Serial clock
6	GND	Ground
7	SD_D0	Data line (bit 0)
8	SD_D1	Data line (bit 1)

Micro-SD Slot (Connector X60)

Connector Type

X60: Micro-SD card slot
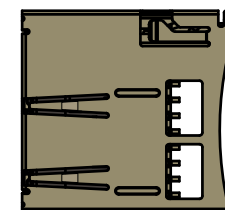
6.4   MIPI CSI-2

The conga-IC175 offers an onboard camera interface on connector X9. The interface supports up to two independent cameras - four data lanes for the first camera and two data lanes for the second camera. Each lane operates at up to 1.5 Gbps depending on the camera's resolution. It also supports up to 24 MP image capture @ 15fps, full HD 1080p60.

The MIPI CSI-2 interface follows the CSI-2 specification as defined by the MIPI Alliance and support YUV420, YUV422, RGB444, RGB555, RGB565, RGB888, JPEG and RAW 8/10/12/14. It is also compliant with the SGET Camera Feature Specification.

Table 40   Connector X9 Pinout Description

Pin #	Signal	Description
1	CAM_PWR	3.3V +/- 5% supply voltage to power the camera device
2	CAM_PWR	3.3V +/- 5% supply voltage to power the camera device
3	CAM0_CSI_D0+	CSI2 Camera 0 Data Lane 0+
4	CAM0_CSI_D0-	CSI2 Camera 0 Data Lane 0-
5	GND	Ground
6	CAM0_CSI_D1+	CSI2 Camera 0 Data Lane 1+
7	CAM0_CSI_D1-	CSI2 Camera 0 Data Lane 1-
8	GND	Ground
9	CAM0_CSI_D2+	CSI2 Camera 0 Data Lane 2+
10	CAM0_CSI_D2-	CSI2 Camera 0 Data Lane 2-
11	CAM0_RST#	Camera 0 Reset (low active)
12	CAM0_CSI_D3+	CSI2 Camera 0 Data Lane 3+
13	CAM0_CSI_D3-	CSI2 Camera 0 Data Lane 3-
14	GND	Ground
15	CAM0_CSI_CLK+	CSI2 Camera 0 Differential Clock+ (Strobe)
16	CAM0_CSI_CLK-	CSI2 Camera 0 Differential Clock- (Strobe)
17	GND	Ground
18	CAM0_I2C_CLK	Camera 0 Control Interface, CLK (1.8V)
19	CAM0_I2C_DAT	Camera 0 Control Interface, DATA (1.8V)
20	CAM0_ENA#	Camera 0 Enable (low active, 1.8V)
21	MCLK	Master Clock (1.8V, 24 MHz frequency)
22	CAM1_ENA#	Camera 1 Enable (low active, 1.8V)
23	CAM1_I2C_CLK	Camera 1 Control Interface, CLK. (1.8V)
24	CAM1_I2C_DAT	Camera 1 Control Interface, DATA (1.8V)
25	GND	Ground
26	CAM1_CSI_CLK+	CSI2 Camera 1 Differential Clock+ (Strobe)
27	CAM1_CSI_CLK-	CSI2 Camera 1 Differential Clock- (Strobe)
28	GND	Ground
29	CAM1_CSI_D0+	CSI2 Camera 1 Data Lane 0+
30	CAM1_CSI_D0-	CSI2 Camera 1 Data Lane 0-

MIPI - Connector X9
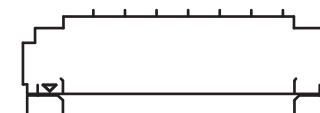
31	CAM1_RST#	Camera 1 Reset (low active, 1.8V)
32	CAM1_CSI_D1+	CSI2 Camera 1 Data Lane 1+
33	CAM1_CSI_D1-	CSI2 Camera 1 Data Lane 1-
34	GND	Ground
35	CAM0_GPIO	GPIO for Camera 0 (1.8V)
36	CAM1_GPIO	GPIO for Camera 1 (1.8V)

Connector Type

X9: 36-pin, 0.5 mm pitch flat-foil connector

6.5 Integrated Sensor Hub

The conga-IC175 offers an Integrated Sensor Hub (ISH) on connector X61.

Table 41   ISH (Connector X61) Pinout Description

ISH - Connector X61

Pin	Signal	Pin	Signal
1	+3.3V	2	+5V
3	+3.3V	4	RSVD
5	N.C	6	I2C0_SDA
7	N.C	8	I2C0_SCL
9	GND	10	I2C1_SDA
11	UART0_RXD	12	I2C1_SCL
13	UART0_TXD	14	GND
15	UART0_RTS	16	GPIO0
17	UART0_CTS	18	GPIO1
19	GND	20	GPIO2
21	UART1_RXD	22	GPIO3
23	UART1_TXD	24	GPIO4
25	UART1_RTS	26	N.C
27	UART1_CTS	28	N.C
29	GND	30	N.C

Connector Type

X61: 2 mm,2x15-pin header
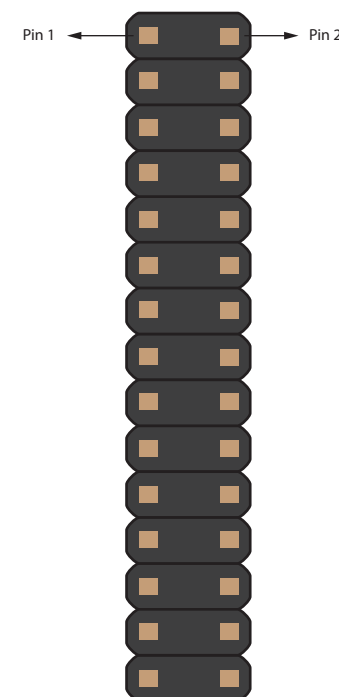
6.6 Case Open Intrusion Connector

The conga-IC175 provides connector X2 for case-open intrusion detection.

Table 42   Case Open Intrusion (Connector X2) Pinout Description

Case Open Intrusion - Connector X2

Pin	Function
1	GND
2	INTRUDER#

Connector Type

X2: 2.54 mm, 2-pin Molex KK series connector
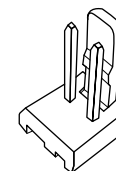
6.7 Trusted Platform Module – TPM (Optional)

The conga-IC175 SBC can be equipped optionally with a TPM 2.0 compliant security chip. The chip is connected to the LPC bus provided by the integrated Intel chipset.

The UEFI boot firmware on the SBC initializes the TPM chip.

6.8 congatec Board Controller (cBC)

The conga-IC175 is equipped with a Texas Instruments Tiva™ microcontroller. This onboard microcontroller plays an important role for most of the congatec BIOS features. It fully isolates some of the embedded features such as system monitoring or the I²C bus from the x86 core architecture, which results in higher embedded feature performance and more reliability, even when the x86 processor is in a low power mode.

6.8.1 Fan Control

The conga-IC175 has additional signals and functions to further improve system management. One of these signals is an output signal called FAN_PWMOUT that allows system fan control using a PWM (Pulse Width Modulation) output. Additionally, there is an input signal called FAN_TACHOIN that provides the ability to monitor the system's fan RPMs (revolutions per minute). This 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.

6.8.2 Power Loss Control

The cBC has full control of the power-up of the SBC and therefore can be used to specify the behavior of the system after an AC power loss condition. Supported modes are "Always On", "Remain Off" and "Last State".

6.8.3 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.

6.9 Embedded BIOS

The conga-IC175 is equipped with congatec Embedded BIOS, which is based on American Megatrends Inc. Aptio UEFI firmware. The BIOS provides the features described below:

6.9.1 OEM Default Settings and OEM BIOS Logo

This feature allows system designers to create and store their own default configuration and BIOS logo (splash screen) within the BIOS flash device. Customized BIOS development by congatec for these changes is no longer necessary because customers can easily do these changes by themselves using the congatec system utility CGUTIL.

6.9.2 OEM BIOS Code

With the congatec embedded BIOS it is even possible for system designers to add their own code to the BIOS POST process. Except for custom specific code, this feature can also be used to support Window 7 SLIC table, verb tables for HDA codecs, rare graphic modes and Super I/O controllers.

For more information about customizing the congatec embedded BIOS, refer to the congatec system utility user's guide (CGUTLm1x.pdf) and can be found on the congatec AG website at www.congatec.com or contact congatec technical support.

6.9.3 congatec Battery Management Interface

In order to facilitate the development of battery powered mobile systems based on embedded modules, congatec AG 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 additional modifications to the system BIOS.

The conga-IC175 BIOS fully supports this interface. For more information about this subject, visit the congatec website and view the following documents:

- congatec Battery Management Interface Specification
- Battery System Design Guide
- conga-SBM[3] User's Guide

6.9.4 API Support (CGOS)

In order 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 and 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 .

6.10 Thermal/Voltage Monitoring

The conga-IC175 SBC features three temperature sensors - the CPU, memory and board controller sensors. The board controller monitors the +12V rail.

6.11 Beeper

The board-mounted speaker (M16) provides audible error code (beep code) information during POST.

Beeper (M16)

6.12 External System Wake Event

The conga-IC175 supports LAN, USB, PCIe and PWRBTN driven wake up events.

6.13 Feature Connector

The conga-IC175 provides an internal 50-pin, 2mm pin header as feature connector. The pinout is described below:

Table 43   Feature Connector X38 Pinout Description

Feature Connector X38

| Pin#	Signal Name	Pin Type	Voltage Level	Onboard Termination	Description
1	+5V	Power	5V		+5V runtime power output (500 mA max).
2	GND	Ground			
3	LAD0	I/O	3.3V		LPC command, address, data 0
4	LAD1	I/O	3.3V		LPC command, address, data 1
5	LAD2	I/O	3.3V		LPC command, address, data 2
6	LAD3	I/O	3.3V		LPC command, address, data 3
7	LFRAME#	Output	3.3V		LPC frame (start of cycle)
8	SERIRQ#	I/O	3.3V	PU 10k	Serial Interrupt Request
9	LPC_CLK (24 MHz)	Output	3.3V		24 MHz clock signal for external LPC device
10	PLT_RST#	Output	3.3V standby		System reset, active low
11	SMB_DAT	I/OD	3.3V standby	PU 4k7	SMBus data
12	SMB_CLK	OD	3.3V standby	PU 4k7	SMBus clock output, up to 100 kHz
13	SMB_ALERT#	Input	3.3V standby	PU 2k2	SMBus Alert (system wake or SMI), active low
14	GND	Ground			
15	TX_CGBC	Output	3.3V standby		UART transmit port from congatec board controller (a debug port)
16	RX_CGBC	Input	3.3V standby	PU 10k	UART receive port from congatec board controller (a debug port)
17	GPO0	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
18	GPO1	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
19	GPO2	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
20	GPO3	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
21	GPO4	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
22	GPO5	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
23	GPO6	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)

24	GPO7	Output	3.3V	PU 4k7	General purpose output from Super IO (LPC)
25	GPI0	Input	3.3V	PU 10k	General purpose input to Board controller
26	GPI1	Input	3.3V	PU 10k	General purpose input to congatec Board controller
27	GPI2	Input	3.3V	PU 10k	General purpose input to congatec Board controller
28	GPI3	Input	3.3V	PU 10k	General purpose input to congatec Board controller
29	GPI4	Input	3.3V	PU 10k	General purpose input to congatec Board controller
30	GPI5	Input	3.3V	PU 10k	General purpose input to congatec Board controller
31	GPI6	Input	3.3V	PU 10k	General purpose input to congatec Board controller
32	GPI7	Input	3.3V	PU 10k	General purpose input to congatec Board controller
33	SLP_S3#	Output	3.3V standby	PD 100k	S3 sleep control (suspend to RAM), active low
34	SLP_S5#	Output	3.3V standby		S5 sleep control (Soft Off), active low
35	SLP_S4#	Output	3.3V standby	PD 100k	S4 sleep control (suspend to Disk), active low
36	LID_BTN#	Input	3.3V standby	PU 10k	Connect directly to LID switch, active low
37	SLP_BTN#	Input	3.3V standby	PU 10k	Connect directly to sleep button, active low
38	THRM#	Input	3.3V	PU 10k	External thermal event, active low. Use open drain configuration on external device
39	WDOUT	Output	3.3V	PD 10k	Watchdog output event (board controller)
40	WDTRIG#	Input	3.3V	PU 10k	Watchdog trigger input (board controller), timer reset, active low. Use open drain configuration on external device
41	I2C_DAT	I/OD	3.3V standby	PU 2k2	I2C data bus from board controller (general use)
42	PWR_OK (optional)	Input	VIN	PU 470k PD 150k	Assembly option only. Power good signal from external PSU or voltage monitor. Use open drain configuration on external device. Onboard power rails are disabled if signal is low.
43	SPI_CS#	Output	3.3V standby	PU 10k	SPI chip select for external SPI flash
44	I2C_CLK	OD	3.3V standby	PU 2k2	I2C clock bus from board controller (general use)
45	SPI_MISO	Input	3.3V standby		External SPI flash data output
46	BIOS_DIS#	Input	3.3V standby	PU 10k	External SPI flash enable (boot from external SPI flash), active low
47	SPI_CLK	Output	3.3V standby		External SPI flash clock input
48	SPI_MOSI	Output	3.3V standby		External SPI flash data input
49	+5V standby	Power	5V standby		+5V standby power, 500mA max
50	GND	Ground			

Connector Type

X38: 2 mm, 2x25-pin header
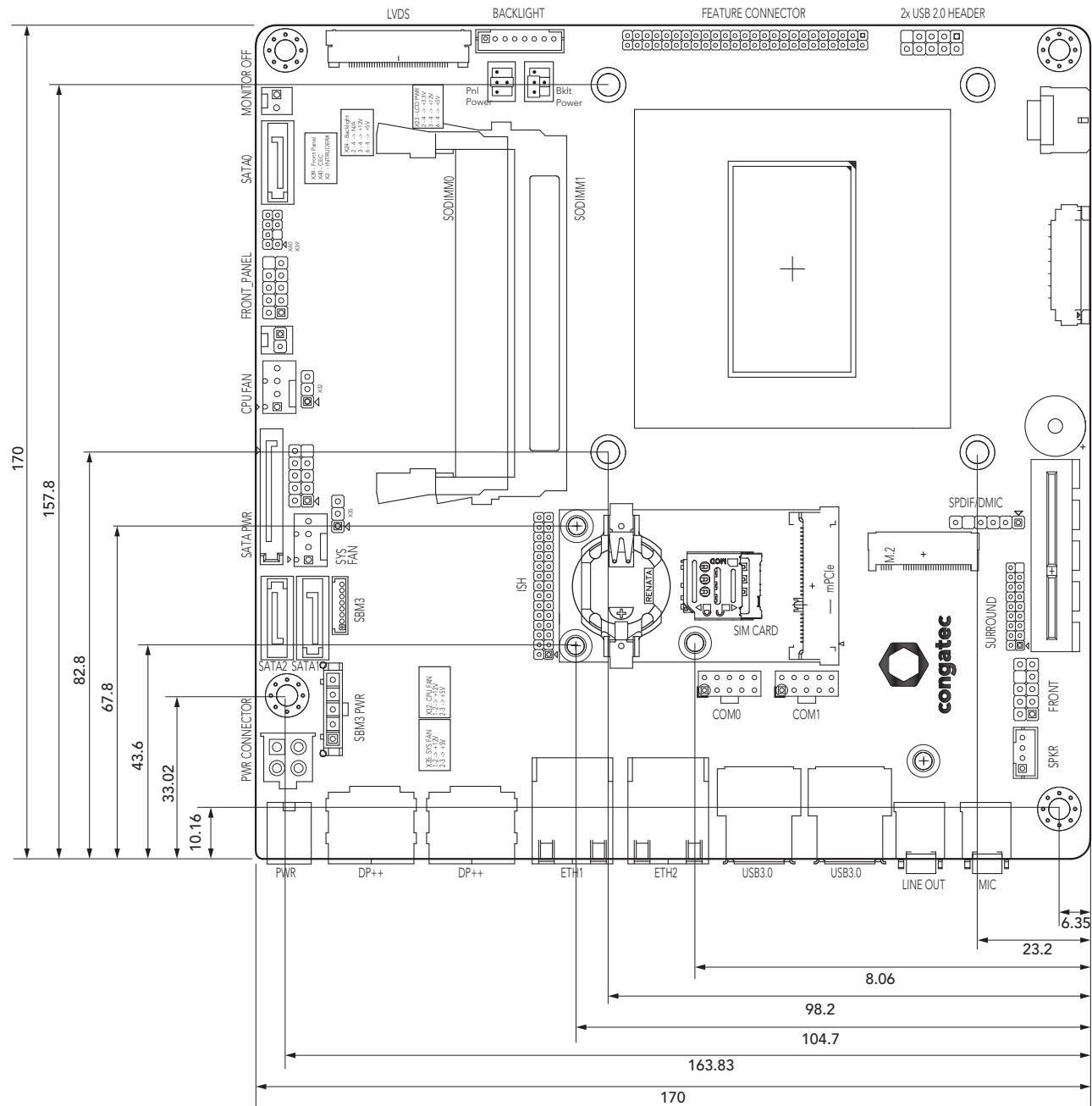
8 BIOS Setup Description

8.1 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.

8.2 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-IC175 is identified as IVKLR1xx or IUKLR1xx, 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 IVKL binary size is 16 MB. The IUKL binary size is 8 MB.

8.3 Updating the BIOS

OEMs often use BIOS updates to correct platform issues discovered after the board has been shipped or when new features are added to the BIOS. The conga-IC175 uses a congatec/AMI AptioEFI firmware, which is stored in an onboard flash ROM chip and can be updated using the congatec System Utility. The utility has four versions—DOS based command line, 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.

9 Industry Specifications

The list below provides links to industry specifications that apply to congatec AG modules.

Specification	Link
Low Pin Count Interface Specification, Revision 1.0 (LPC)	http://developer.intel.com/design/chipsets/industry/lpc.htm
Universal Serial Bus (USB) Specification, Revision 2.0	http://www.usb.org/home
PCI Specification, Revision 2.3	http://www.pcisig.com/specifications
Serial ATA Specification, Revision 3.0	http://www.serialata.org
PICMG® COM Express Module™ Base Specification	http://www.picmg.org/
PCI Express Base Specification, Revision 2.0	http://www.pcisig.com/specifications