

conga-IC370 Thin Mini-ITX SBC

8th Generation Intel Core i7, i5, i3 and Celeron Single Chip Ultra Low TDP U-Series SoC

User's Guide

Revision 1.6

Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
0.1	2020-02-26	AEM	<ul style="list-style-type: none">• Preliminary release
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1.5	2021-03-30	AEM	<ul style="list-style-type: none">• Deleted cables with part numbers 48000029, 14000128, 14000161, 14000259, 14000260, 14000261 and 14000274 from table 3 "Cables"• Deleted adapter with part number 052232 from table 4 "Adapters"• Corrected Ethernet description in table 5 "Feature Summary"
1.6	2021-07-31	AEM	<ul style="list-style-type: none">• Added Software License Information• Changed congatec AG to congatec GmbH• Deleted optional CAN header from table 5 "Feature Summary"• Deleted section 6.5 "Optional CAN header"• Updated section 6.7 "congatec Battery Management Interface"

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This user's guide provides information about the components, features and connectors available on the conga-IC370 Thin Mini-ITX single board computer.

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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.

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Terminology

Term	Description
cBC	congatec Board Controller
DVI	Digital Visual Interface
eDP	Embedded DisplayPort
GbE	Gigabit Ethernet
HDA	High Definition Audio
iDP	Internal DisplayPort
I ² C Bus	Inter-Integrated Circuit Bus
LPC	Low Pin-Count
LVDS	Low-Voltage Differential Signaling
N.A	Not available
N.C	Not connected
PCIe	Peripheral Component Interface Express
PN	Part Number
PTT	Platform Trust Technology
SATA	Serial AT Attachment
SBC	Single Board Computer
SDIO	Secure Digital Input Output
SM Bus	System Management Bus

SPI	Serial Peripheral Interface
S/PDIF	Sony/Philips Digital Interconnect Format
S5e	Enhanced S5 (congatec proprietary low-power soft-off state)
T.B.D	To be determined
USB	Universal Serial Bus
WDG	Watchdog

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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-IC370

The conga-IC370 is a Single Board Computer designed based on the Thin Mini-ITX specification. The conga-IC370 features the 8th Generation Intel Core or Celeron U-Series processors. With 15 W 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 2400 MT/s for a maximum system memory capacity of 64 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-IC370 SBC provides manufacturers and system designers with the opportunity to design compact systems for space restricted areas.

The various features and capabilities offered by the conga-IC370 makes it ideal for the design of compact, energy efficient, performance-oriented embedded systems.

1.2.1 Options Information

The conga-IC370 is currently available in four variants. The table below shows the different configurations available.

Table 1 conga-IC370 Variants

Part-No.	053001	053002	053003	053005
Processor	Intel® Core™ i7-8665UE 1.7 GHz Quad Core™	Intel® Core™ i5-8365UE 1.6 GHz Quad Core™	Intel® Core™ i3-8145UE 2.2 GHz Dual Core™	Intel® Celeron® 4305UE 2.0 GHz Dual Core
Intel® Smart Cache	8 MB	6 MB	4 MB	2 MB
Max. Turbo Frequency	4.4 GHz	4.1 GHz	3.9 GHz	N.A
Processor Graphics	Intel® UHD Graphics 620 (GT2)	Intel® UHD Graphics 620 (GT2)	Intel® UHD Graphics 620 (GT2)	Intel® UHD Graphics 610 (GT1)
GFX Base/Max. Dynamic Freq.	0.3 / 1.15 GHz	0.3 / 1.05 GHz	0.3 / 1.0 GHz	0.3 / 1.0 GHz
DDR4 Memory	2400 MT/s dual channel Non-ECC (up to 64 GB)	2400 MT/s dual channel Non-ECC (up to 64 GB)	2400 MT/s dual channel Non-ECC (up to 64 GB)	2133 MT/s dual channel Non-ECC (up to 64 GB)
Processor TDP (cTDP)	15 W (12.5/25 W)	15 W (12.5/25 W)	15 W (12.5/25 W)	15 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-IC370)
conga-IC97/Retention Frame	052254	Retention frame for conga-IC97/CSA (compatible with conga-IC370)
conga-IC370 IO Shield - Standard Size	053060	IO shield for conga-IC370 Mini-ITX height
conga-IC370 IO Shield - Thin Size	053061	IO shield for conga-IC370 with Thin Mini-ITX height

Table 3 Cables

Cables	Part No.	Description
SATA III cable down/straight	48000030	30 cm SATA III cable with down-straight connectors
cab-ThinMini-ITX-UART	14000121	UART cable with 2 x5-pin female housing and D-Sub male connector
cab-ThinMini-ITX-USB20-Twin	14000123	USB 2.0 cable with dual USB 2.0 Type A female connector and 2 x 5-pin housing
cab-ThinMini-ITX-BKLT	14000127	30 cm backlight cable with open end
cab-ThinMini-ITX-eLVDS	14000129	30 cm ACES micro-coax cable for eDP or iDP
cab-Pico-ITX-GPIO	14000151	15 cm GPIO cable with open end
cab-LVDS SHDR-40V	14000254	50 cm, 40-pin LVDS cable with JST SHDR-40 connector and open end
cab-LVDS SHDR-40V FI-X30HL	14000256	50 cm, 40-pin LVDS cable with JST SHDR-40 and JAE FI-X30HL connectors (for AUO G170EG01 V1 LCD panel)
cab-ThinMini-ITX-RS422	14000257	RS422 D-SUB9 adapter with 120 ohm bus termination for internal JST PHR-5 connector
cab-ThinMini-ITX-RS485	14000258	RS485 D-SUB9 adapter with 120 ohm bus termination for internal JST PHR-5 connector
USB C to internal USB 3.1	14000265	45 cm right-angle USB Type-C cable adapter for internal USB 3.1 connector
cab-ThinMini-ITX-BLKT 0511460600	14000272	50 cm backlight cable for LCD panel AUO G170EG01 V1
cab-ThinMini-ITX-Front Panel	14000273	15 cm Front panel cable adapter with buttons and LEDs

Table 4 Adapters

Adapters	Part No.	Description
conga-Thin MITX/eDP to DP adapter	052231	eDP to standard DP adapter for variants with internal DP
conga-eDP to LVDS Adapter	052234	eDP to LVDS adapter for variants with internal DP

2 Specification

2.1 Feature List

Table 5 Feature Summary

Form Factor	Based on Thin Mini-ITX form factor (170 x 170 mm)	
Processor	8 th 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-IC370). Supports <ul style="list-style-type: none"> - SO-DIMM non-ECC DDR4 modules - Data rates up to 2400 MT/s - Maximum 64 GB capacity (32 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® 300 Series PCH-LP integrated in the Multi-Chip Package	
Audio	Realtek ALC888S-VD High Definition Audio	
Ethernet	2x Gigabit Ethernet via: <ul style="list-style-type: none"> - Intel® I219-LM (supports vPro/AMT on i7 and i5 variants) or optional Intel® I219-V - Intel® I225-LM (with support for TSN) or optional Intel I255-V (without TSN) 	
Graphic Interfaces	2x DP++ 1x LVDS/eDP	
Back Panel I/O Connectors	1x DC-IN 2x DisplayPort++ 1x Gigabit Ethernet 1x 2.5 Gigabit Ethernet	2x USB 3.1 Gen 2 Type-A 2x USB 2.0 Type-A 1x MIC IN 1x Line OUT
Onboard I/O Connectors	<p>Extension Sockets:</p> <ul style="list-style-type: none"> - 1x PCIe x4 - 1x Mini Card full-size or half-size (PCIe x1/USB) - 1x M.2 key B, type 2280/2242/3042 (PCIe x2/SATA/SIM) - 1x M.2 key E, type 2230 (PCIe x1/USB/CNVi) <p>SATA Connectors:</p> <ul style="list-style-type: none"> - 2x Standard SATA 3.0/SATADOM - 1x SATA power header (12 V and 5 V) <p>Audio</p> <ul style="list-style-type: none"> - 1x Stereo speaker header - 1x DMIC header - 1x SPDIF header - 1x Front panel header (HP-Out, MIC) <p>1x Dual USB 2.0 front panel header 1x USB 3.1 front panel header (Type-A or Type-C)</p>	<p>1x LVDS connector (top-side) 1x eDP connector (bottom-side) 1x Backlight power connector 1x Monitor OFF 4x COM ports 1x Micro-SD card slot 2x GPIO headers 2x SMB/I2C connectors 1x Feature connector (3.3 V, WDG, S3, S4, S5, PWROK, BATLOW, SDP) 1x Front panel header (power and reset buttons, LEDs) 1x Sleep button and LID switch header 1x Intrusion detection header (case open) 1x Micro-SIM card slot 2x Fan connectors (CPU and system fan) 1x Mini-FIT power connector</p>
Optional Onboard Connectors	1x Internal DP (this option does not support DisplayPort signals on connector X25) 2x SATADOM power header	

Other Features	Thermal and voltage monitoring CMOS Battery Beeper congatec standard BIOS (also possible to boot from an external BIOS flash)
BIOS	AMI Aptio® V UEFI 2.6 firmware 32 MB serial SPI flash with congatec Embedded BIOS features
Power Management	ACPI 4.0 compliant with battery support. Also supports Suspend to RAM (S3) and Intel AMT 11. Configurable TDP Ultra low standby power consumption, deep sleep.
Security	Firmware TPM 2.0 (Intel PTT) Discrete TPM 2.0 (Infineon SLB9670)

2.2 Supported Operating Systems

The conga-IC370 supports the following operating systems.

- Microsoft® Windows® 10
- Microsoft® Windows® 10 IoT Enterprise
- Linux
- Yocto
- Real Time Systems Hypervisor



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

2.3 Mechanical Dimensions

The conga-IC370 has the following dimensions:

- length of 170 mm
- width of 170 mm
- height of 20.6 mm (16 mm top-side, 1.6 mm PCB and 3 mm bottom-side)

2.4 Supply Voltage Power

- 12–24V DC \pm 5 %

2.5 Power Consumption

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

- Input voltage +12V
- conga-IC370 SBC
- conga-IC370 CSA
- Microsoft Windows 10 (64 bit)



Note

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

Table 6 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 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 12 V	
S5	SBC is powered by 12 V	



Note

1. *The fan and SATA drives were powered externally.*
2. *All other peripherals except the LCD monitor were disconnected before measurement.*

Table 7 Power Consumption Values

The table below provides additional information about the conga-IC370 power consumption. The values were recorded at various operating mode.

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
053001	2 x 4 GB	A.0	R000	Windows 10	Intel® Core™ i7-8665UE	4	1.7 / 4.4 GHz	0.39	2.56	5.82	0.06	0.05	0.001
053002	2 x 4 GB	A.0	R000	Windows 10	Intel® Core™ i5-8365UE	4	1.6 / 4.1 GHz	0.36	2.56	3.97	0.05	0.05	0.001
053003	2 x 4 GB	A.0	R000	Windows 10	Intel® Core™ i3-8145UE	2	2.2 / 3.9 Ghz	0.34	2.43	3.50	0.06	0.05	0.001
053005	2 x 4 GB	A.0	R000	Windows 10	Intel® Celeron® 4305UE	2	2.0 / N.A GHz	0.37	1.41	1.47	0.05		0.001



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

2.6 Supply Voltage Battery Power

Table 8 CMOS Battery Power Consumption

RTC @	Voltage	Current
-10°C	3V DC	2.17 µA
20°C	3V DC	2.76 µA
70°C	3V DC	7.87 µA



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 GmbH website at www.congatec.com/support/application-notes.
4. We recommend to always have a CMOS battery present when operating the conga-IC370

2.7 Environmental Specifications

Temperature Operation: 0° to 60°C Storage: -20° to +70°C

Humidity Operation: 10% to 90% Storage: 5% to 95%

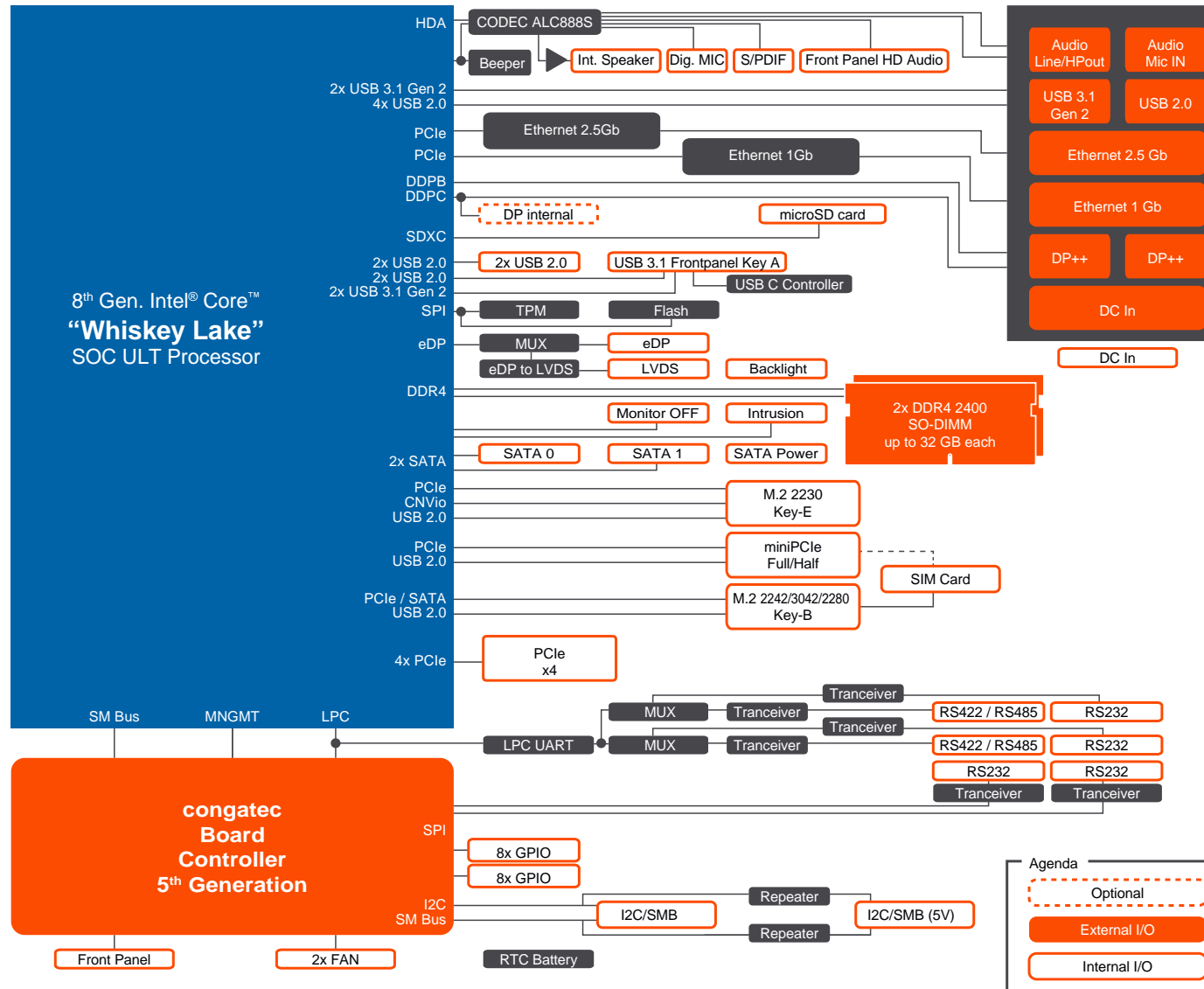


The above operating temperatures must be strictly adhered to at all times. Humidity specifications are for non-condensing conditions.

3 Block Diagram

conga-IC370

Thin Mini-ITX Single Board Computer



4 Cooling Solution

The conga-IC370 supports the cooling solutions listed in the table below. 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	congatec CSA	052252	Active cooling solution with integrated heatsink and congatec retention frame (PN: 052254)
2	Custom cooling solution	N.A	Custom cooling solution in combination with the congatec retention frame

Note

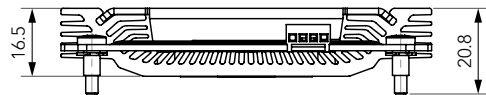
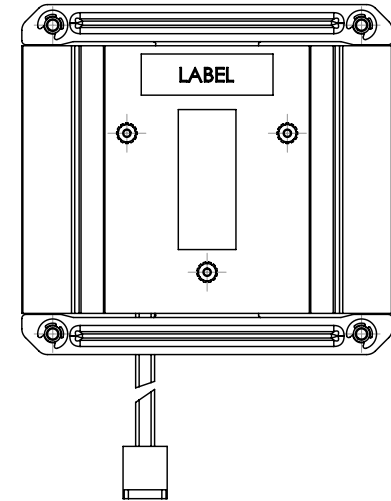
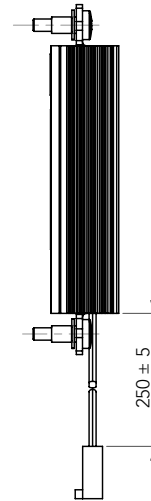
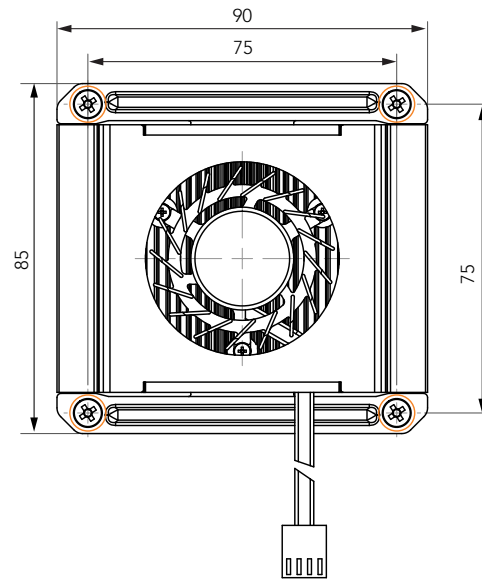
1. The retention frame acts as mounting backplate and board reinforcement.
2. We recommend a maximum torque of 0.4 Nm for SBC mounting screws and 0.5 Nm for CPU mounting screws.
3. With passive or custom cooling solution, the end user must make sure that adequate air flow is maintained.
4. The congatec conga-IC370 cooling solutions support maximum TDP of 15 W. For applications with higher TDP, you need a custom cooling solution or additional cooling components.




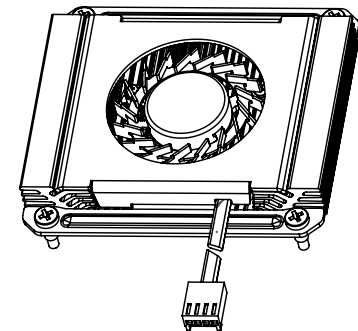
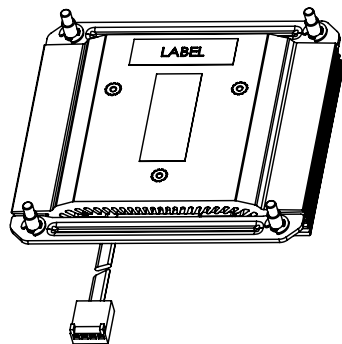
Caution

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 SBC 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 SBC. 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 SBC.

4.1 CSA Dimensions



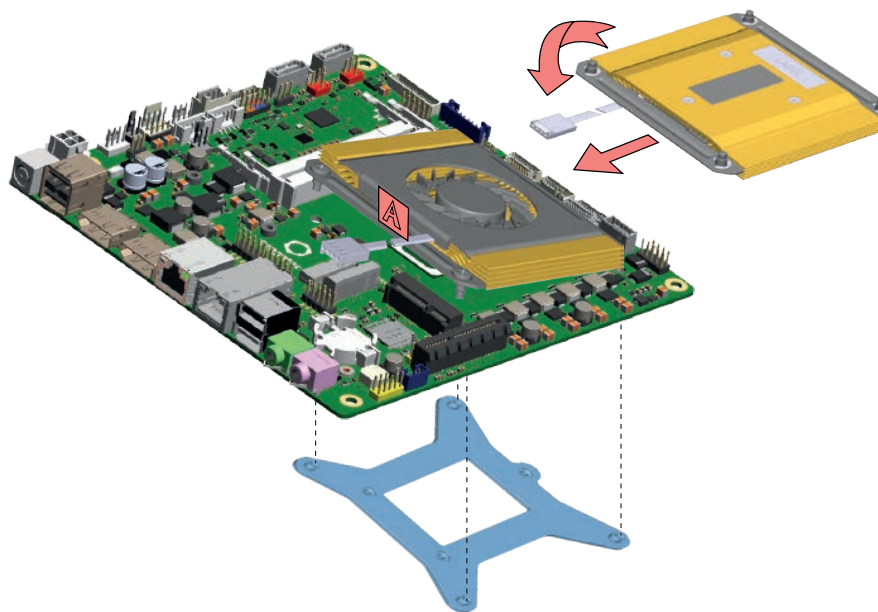
 M3 screws for attaching cooling solution to retention frame



4.2 Assembly Instruction

Follow the instructions below to securely attach a cooling solution to the conga-IC370:

- 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. Make sure the retention frame is placed correctly, without touching surrounding components.
- Remove the protection pull tab foil from the cooling phase changer and carefully place the cooling solution. Ensure the cooling solution cable is in position A shown below.
- 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 to the power connector.



Caution

Wrong placement of the retention frame may damage some electronic components. Before you tighten the cooling solution to the retention frame, ensure the retention frame is aligned properly.

5 Connector Description

5.1 Power Supply Connectors

The conga-IC370 provides a DC power jack and a 4-pin Mini-Fit connector. The power input is protected by a 15A non-resettable fuse.



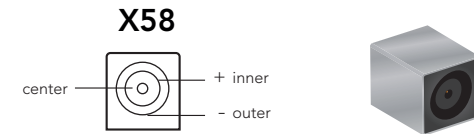
- 1. We recommend a maximum input current of 8 A.
- 2. The conga-IC370 turns on immediately power is supplied. To change this default setting, enter the BIOS setup menu under "Boot Settings Configuration" and set the "Power Loss Control" to "Remain OFF".

5.1.1 DC Power Jack (Rear I/O)

The conga-IC370 provides DC power jack X58 for connecting laptop-type DC power supply.

Table 10 X58 Pinout Description

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



Connector Type

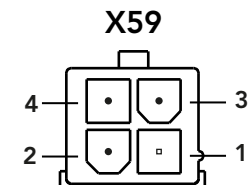
X58 : 7.4 x 5.1 mm DC power jack

5.1.2 Mini-Fit 4-Pin Connector

The conga-IC370 provides an internal 4-pin Mini-Fit connector X59 with voltage protection.

Table 11 X59 Pinout Description

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





Note

The conga-IC370 offers a right-angle, 4-pin Mini-Fit connector via assembly option.



Connector Type

X59 : 2 x 2-pin, 4.2 mm pitch Mini-Fit connector (Molex 87427-0442)

Possible Mating Connector: Molex 39012040

5.1.3 Power Status LEDs

The conga-IC370 provides onboard LEDs D66, D69 and D70 for power state indication. In addition, you can connect a bidirectional LED to pins 2 and 4 (FP_LED+ and FP_LED-) of the front panel connector X47 for power state indication.

Table 12 Front Panel LED States

ACPI State	X47 (Pins 2 and 4) LED Status	Description
S0	FP_LED+ high and FP_LED- low	System on and running (bidirectional LED on with main color)
S3	FP_LED+ low and FP_LED- high	Suspend to RAM (bidirectional LED on with alternate color)
S5	FP_LED+ low and FP_LED- low	Soft-off (bidirectional LED LED off)

Table 13 Onboard LED States

ACPI State	Onboard LED	Description
Deep S5, S5e	D66	Steady on—deep S5 state Blinks—S5e state (congatec proprietary low-power soft-off state)
S3, S5	D69	Soft-off, Suspend to RAM
S0	D70	System on and running



Note

The front panel pinout is described in section 5.11 “Front Panel Header”.

5.1.4 Power-On Control Jumper

The conga-IC370 provides jumper X61 for controlling the power-on control feature.

Table 14 Auto Power-On Control

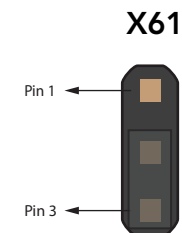
Jumper	Configuration
1-2	Disable auto power-on control (ATX mode)
2-3	Enable auto power-on control (AT mode)



Jumper X61 has no effect if the power-on control is enabled in the BIOS setup menu.

Connector Type

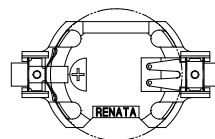
X61 : 1 x 3-pin, 2.5 mm pitch pin header



5.1.5 CMOS Battery Header

The conga-IC370 provides a CR2032 CMOS battery which is attached to battery holder M24. The battery supplies power to maintain the CMOS settings and real time clock.

M24



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.

5.2 Extension Sockets

The conga-IC370 provides the following extension sockets:

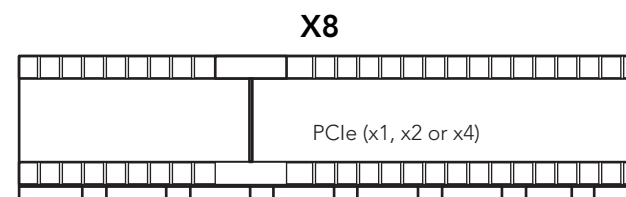
- PCIe x4
- PCIe Mini PCIe Card—full or half size (PCIe x1/USB)
- M.2 key B, type 3042/2280/2242 (PCIe x2/SATA/USB/SIM)
- M.2 key E, type 2230 (PCIe x1/USB/CNVi)

5.2.1 PCIe x4 Socket

The conga-IC370 provides a PCIe x4 socket (X8) for connecting PCIe x1, x2 or x4 cards. The socket supports PCIe Gen 3 (up to 8 GT/s per lane).

Table 15 X8 Pinout Description

Pin	Signal	Pin	Signal
B1	+12V	A1	GND
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	PCIE0_TX+	A14	PCIE_CLK-
B15	PCIE0_TX-	A15	GND
B16	GND	A16	PCIE0_RX+
B17	PRSNT2#	A17	PCIE0_RX-
B18	GND	A18	GND



B19	PCIE1_TX+	A19	N.C
B20	PCIE1_TX-	A20	GND
B21	GND	A21	PCIE1_RX+
B22	GND	A22	PCIE1_RX-
B23	PCIE2_TX+	A23	GND
B24	PCIE2_TX-	A24	GND
B25	GND	A25	PCIE2_RX+
B26	GND	A26	PCIE2_RX-
B27	PCIE3_TX+	A27	GND
B28	PCIE3_TX-	A28	GND
B29	GND	A29	PCIE3_RX+
B30	N.C	A30	PCIE3_RX-
B31	PRSNT#2	A31	GND
B32	GND	A32	N.C

Connector Type

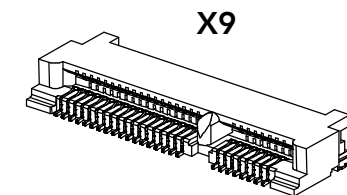
X8: Standard PCIe x4 socket

5.2.2 PCIe Mini Card Socket

The conga-IC370 provides a PCIe Mini Card socket (X9). The socket supports full or half size PCIe or USB 2.0 cards.

Table 16 X9 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



Pin	Signal	Pin	Signal
19	N.C	20	W_DISABLE#
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	N.C
45	N.C	46	N.C
47	N.C	48	+1.5V
49	N.C	50	GND
51	N.C	52	+3.3V

 **Note**

¹ The micro-SIM card slot (X11) can optionally be connected to these pins (assembly option).

 **Connector Type**

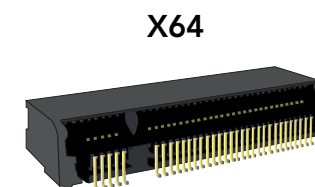
X9: Standard Mini Card socket (full size or half size)

5.2.3 M.2 Key B Socket

The conga-IC370 provides an M.2 key B, type 2242/2280/3042 socket (X64) for connecting SSDs or WWAN (PCIe x2, SATA or USB) cards.

Table 17 X64 Pinout Description

Pin	Signal	Pin	Signal
1	CONFIG3	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	N.C
11	GND	12	Key
13	Key	14	
15		16	
17		18	
19		20	N.C
21	CONFIG0	22	N.C
23	N.C	24	N.C
25	N.C	26	W_DISABLE_2#
27	GND	28	N.C
29	PCIe1_Rx-	30	UIM_RESET
31	PCIe1_Rx+	32	UIM_CLK
33	GND	34	UIM_DATA
35	PCIe1_Tx-	36	UIM_PWR
37	PCIe1_Tx+	38	SATA_DEVSLP
39	GND	40	N.C
41	PCIE0_Rx-/SATA_Rx+	42	N.C
43	PCIE0_Rx+/SATA_Rx-	44	N.C
45	GND	46	N.C
47	PCIE0_Tx-/SATA_Tx-	48	N.C
49	PCIE0_Tx+/SATA_Tx+	50	PERST#
51	GND	52	CLKREQ#
53	REFCLK-	54	PEWAKE#
55	REFCLK+	56	N.C



Pin	Signal	Pin	Signal
57	GND	58	N.C
59	N.C	60	COEX3
61	N.C	62	COEX2
63	N.C	64	COEX1
65	N.C	66	N.C
67	RESET#	68	SUS_CLK
69	CONFIG1	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	CONFIG2		



Note
The micro-SIM card slot is connected to the UIM interface by default.



Connector Type

X64: Standard PCIe M.2 key B socket

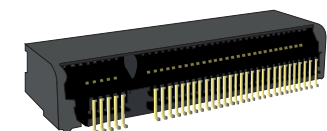
5.2.4 M.2 Key E Socket

The conga-IC370 provides an M.2 key E, type 2230 socket (X12) for connecting a PCIe, USB or Intel® CNVi WLAN card.

Table 18 X12 Pinout Description

Pin	Signal	Pin	Signal
1	GND	2	+3.3V
3	USB_D+	4	+3.3V
5	USB_D-	6	N.C
7	GND	8	PCM_CLK
9	CNV_WR_D1-	10	PCM_SYNC
11	CNV_WR_D1+	12	PCM_IN
13	GND	14	PCM_OUT
15	CNV_WR_D0-	16	N.C
17	CNV_WR_D0+	18	GND

X12



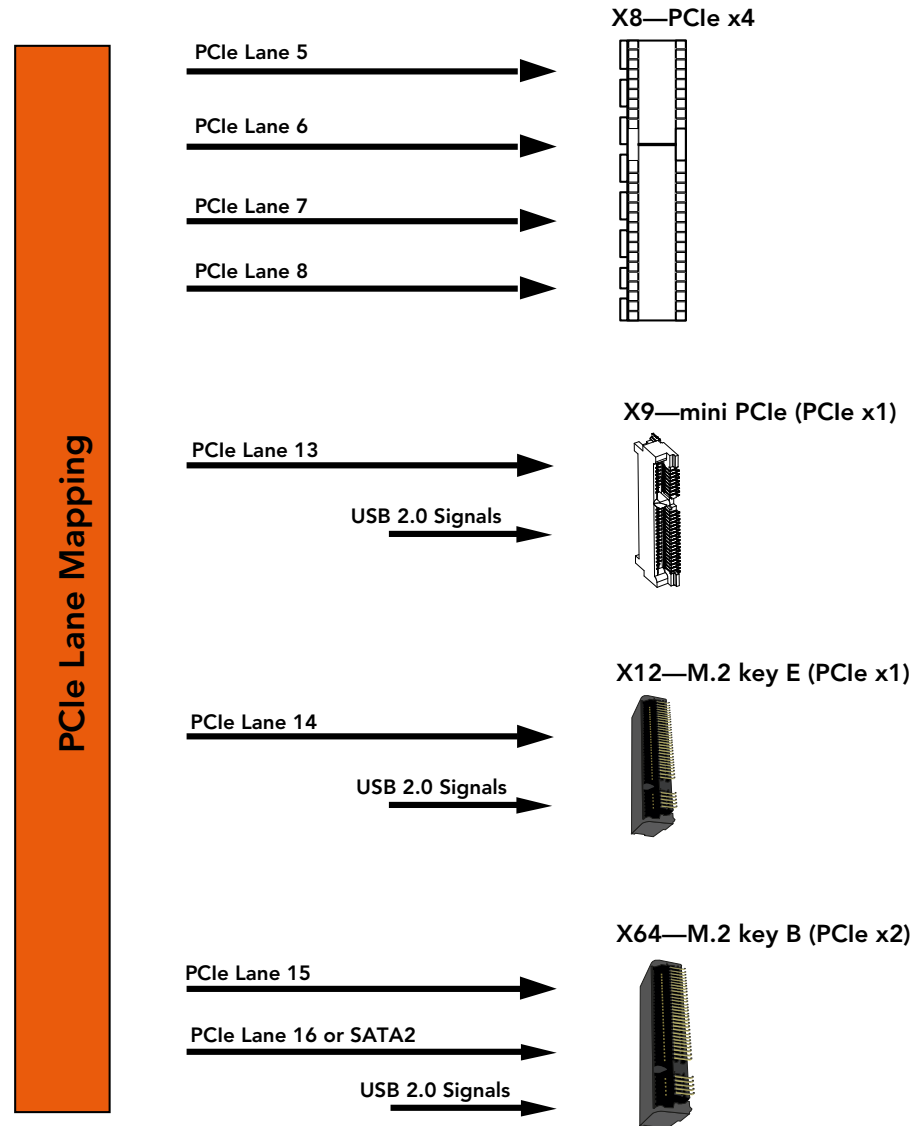
Pin	Signal	Pin	Signal
19	GND	20	BT_WAKE#
21	CNV_WR_CLK-	22	CNV_BRI_RSP
23	CNV_WR_CLK+	24	Key
25	Key	26	
27		28	
29		30	
31		32	CNV_RGI_DT
33	GND	34	CNV_RGI_RSP
35	PCIe0_Tx+	36	CNV_BRI_DT
37	PCIe0_Tx-	38	CL_RST#
39	GND	40	CL_DATA
41	PCIe0_Rx+	42	CL_CLK
43	PCIe0_Rx-	44	COEX3
45	GND	46	COEX2
47	REFCLK0+	48	COEX1
49	REFCLK0-	50	SUSCLK
51	GND	52	PERST#0
53	CLKREQ0#	54	BT_W_DISABLE#2
55	PEWAKE0#	56	Wifi_W_DISABLE#1
57	GND	58	N.C
59	CNV_WT_D1-	60	N.C
61	CNV_WT_D1+	62	N.C
63	GND	64	CNV_REFCLK
65	CNV_WT_D0-	66	PERST#1
67	CNV_WT_D0+	68	N.C
69	GND	70	N.C
71	CNV_WT_CLK-	72	+3.3V
73	CNV_WT_CLK+	74	+3.3V
75	GND		

Connector Type

X12: Standard PCIe M.2 key E socket

5.2.5 PCI Express Routing

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



5.3 Display Interfaces

The conga-IC370 supports three independent displays—two DP++ and an LVDS or eDP panel. The graphic engine supports DirectX 12, OpenGL 4.5, OpenCL 2.1, Intel QuickSync and Clear Video Technology HD, hybrid graphics.

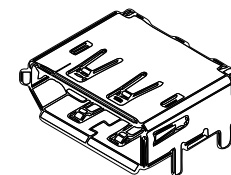
Optionally, the conga-IC370 can support iDP instead of DP++ on X25 (assembly option) .

5.3.1 Display Port

The conga-IC370 provides two DP++ ports (X24 and X25). The ports support the following:

- VESA DisplayPort Standard 1.2
- data rate of 5.4 GT/s with four data lanes
- resolutions up to 4096 x 2304 at 60 Hz
- audio formats such as AC-3 Dolby Digital, Dolby Digital Plus, DTS-HD, LPCM, Dolby TrueHD, DTS-HD Master audio

X24, X25



Note

The conga-IC370 supports up to 4k resolution only if you populate both memory sockets with modules of same size and speed.



Connector Type

X24, X25: Standard DisplayPort connector

5.3.2 LVDS Header

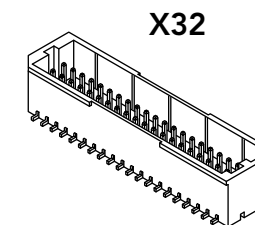
The conga-IC370 offers LVDS interface on X32. The LVDS source signals are shared with eDP interface on X27. The source signals are configured in the BIOS to support LVDS by default.

The LVDS interface is on the top side of the SBC and it supports the following:

- 18 or 24 bit, single or dual channel
- selectable panel voltage
- VESA or JEIDA data mapping
- ANSI/TIA/EIA-644-1-2001 standard
- automatic panel detection (EDID)
- resolution up to 1920 x 1200 at 60 Hz in dual LVDS mode

Table 19 X32 Pinout Description

Pin	Signal	Pin	Signal
1	VCC (fuse with 1.5 A hold current at 25°C)	2	VCC (fuse with 1.5 A hold current at 25°C)
3	VCC (fuse with 1.5 A hold current at 25°C)	4	VCC (fuse with 1.5 A hold current at 25°C)
5	VCC_EDID (+3.3 V)	6	GND
7	EDID_CLK	8	EDID_DATA
9	N.C	10	VDDEN
11	GND	12	GND
13	LVDS_ODD_TX0N	14	LVDS_ODD_TX1N
15	LVDS_ODD_TX0P	16	LVDS_ODD_TX1P
17	GND	18	GND
19	LVDS_ODD_TX2N	20	LVDS_ODD_CLKN
21	LVDS_ODD_TX2P	22	LVDS_ODD_CLKP
23	GND	24	GND
25	LVDS_ODD_TX3N	26	LVDS_EVEN_TX0N
27	LVDS_ODD_TX3P	28	LVDS_EVEN_TX0P
29	GND	30	GND
31	LVDS_EVEN_TX1N	32	LVDS_EVEN_TX2N
33	LVDS_EVEN_TX1P	34	LVDS_EVEN_TX2P
35	GND	36	GND
37	LVDS_EVEN_CLKN	38	LVDS_EVEN_TX3N
39	LVDS_EVEN_CLKP	40	LVDS_EVEN_TX3P



 **Note**

1. EDID signals and VDDEN output are 3.3 V.
2. The maximum output current for LCD and backlight power rails is 1.5 A.
3. Use ODD pins for single channel LVDS panel.
4. Use jumper X29 to set the LVDS panel voltage

 **Connector Type**

X32: 40-pin, 1 mm pitch header (JST BM40B-SRDS-G-TF)

Possible Mating Connector: JST SHDR-40V-S-B

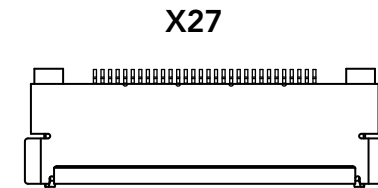
5.3.3 Embedded DisplayPort (eDP)

The conga-IC370 provides eDP interface on X27. The eDP source signals are configured in the BIOS to support LVDS by default. For eDP support, go to Advanced -> Graphics -> Active LFP Configuration submenu in the BIOS setup menu and select "eDP".

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

Table 20 X27 Pinout Description

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



Note

- ¹ Set the eDP panel voltage (3.3 V, 5 V or 12 V) with jumper X29
- ² 3.3 V input signal

3. Set the voltage level (3.3 V or 5 V) with jumper X65
4. Set the voltage level (5 V, 12 V or 19 V) with jumper X30

Connector Type

X27: 0.5 mm, 40-pin ACES connector
Possible Mating connector: ACES 88441-40 or ACES 50204-40

5.3.4 Panel Voltage Selection Jumper

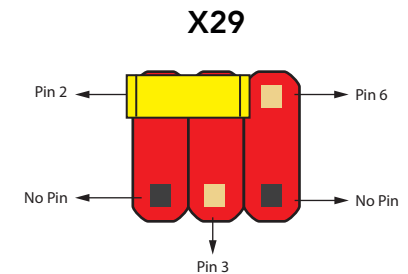
The conga-IC370 supports 3.3V, 5V and 12V LCD panels. Use jumper X29 to set the LVDS or eDP panel voltage.

Table 21 X29 Pinout Description

Jumper	Panel Voltage
2-4	3.3V (default)
3-4	12V
4-6	5V

Connector Type

X29: 2.54 mm, 2 x 3-pin header (without pins 1 and 5)

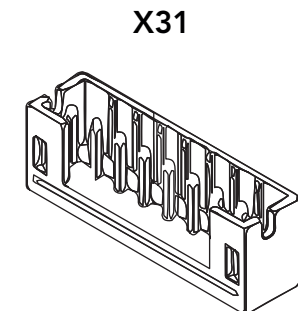


5.3.5 Backlight Power Connector

The conga-IC370 provides backlight power connector X31. The maximum output current is 3 A.

Table 22 X31 Pinout Description

Pin	Signal Name	Description
1	BKLT_EN ¹	Backlight enable
2	BKLT_CTRL ¹	Backlight control
3	BKLT_PWR ²	Backlight inverter power
4	BKLT_PWR ²	Backlight inverter power
5	GND	Backlight ground
6	GND	Backlight ground



7	BRT_UP ³	Increase flat panel brightness
8	BRT_DOWN ³	Decrease flat panel brightness

 **Note**

1. Set the voltage level (3.3 V or 5 V) with jumper X65.
2. Set the voltage level (5 V, 12 V or 19 V) with jumper X30
3. 3.3 V input signals. Connect signals to push buttons to control the panel brightness

 **Connector Type**

X31: 2 mm, 8-pin Crimp style connector (JST B8B-PH-SM4-TB)
Possible Mating Connector: JST PHR-8

5.3.6 Backlight Power Selection Jumper

The conga-IC370 offers 5 V, 12 V or 19 V for LCD backlight. Use jumper X30 to select the voltage level.

Table 23 X30 Pinout Description

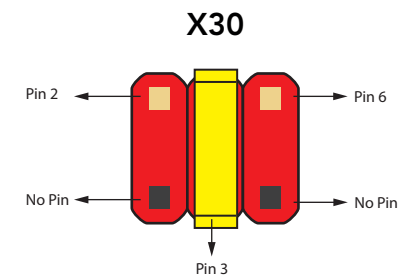
Jumper	Backlight Voltage
2-4	19V
3-4	12V (default)
4-6	5V

 **Note**

Backlight voltage of 19 V requires an input voltage of 19–24 V

 **Connector Type**

X30: 2.54 mm, 3 x 2-pin header (without pins 1 and 5)



5.3.7 Backlight Control Jumper

The conga-IC370 supports LCD backlight control signals with 5 V or 3.3 V. Use jumper X65 to set the voltage level for pins 1 and 2 of the backlight power connector X31.

Table 24 X65 Pinout Description

Jumper	Description
1-2	3.3 V
2-3	5 V



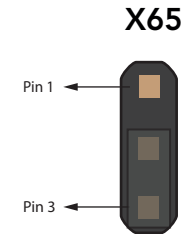
Note

If an LCD panel is not used, remove the jumper to reduce the power consumption.



Connector Type

X65: 2.54 mm, 1 x 3-pin header



5.3.8 Monitor OFF Header

The conga-IC370 provides monitor OFF header X28. Connect a momentary normally-open switch to X28, to switch on or switch off the backlight power of displays on LVDS or eDP connectors.

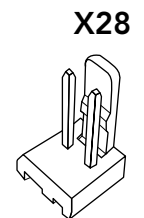
Table 25 X28 Pinout Description

Pin	Description
1	GND
2	MONITOR_OFF#



Connector Type

X28: 2.54 mm pitch, 2-pin Molex 22-27-2021



5.4 USB Connectors

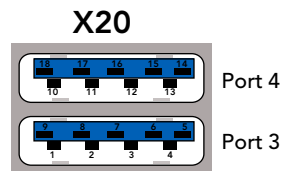
The conga-IC370 provides 10 USB ports—four on the rear connectors, three on internal headers and three for extension sockets (mini card, M.2 key B and M.2 key E).

The conga-IC370 provides four USB connectors:

- two rear connectors:
 - dual-stacked USB 3.1 Gen 2 Type-A
 - dual-stacked USB 2.0 Type-A
- two internal connectors
 - front panel header with two USB 2.0 ports
 - front panel header for USB 3.1 Type-C or Type-A port

5.4.1 Rear USB 3.1 Gen 2 Port

The conga-IC370 provides two USB 3.1 Gen 2 ports on connector X20. Each port supports a maximum current of 1 A.



Note

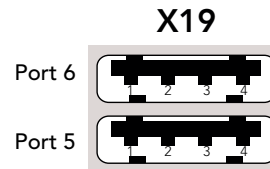
1. X20 ports (port 3 and 4) are only USB 3.1 Gen 1 compliant.
2. X20 does not support Wake on USB by default (requires assembly option)

Connector Type

X20: Dual-stacked USB 3.1 Gen 2 Type-A connector

5.4.2 Rear USB 2.0 Port

The conga-IC370 provides two USB 2.0 ports on connector X19. Each port supports a maximum current of 1 A.



Connector Type

X19: Dual-stacked USB 2.0 Type-A connector

5.4.3 Internal USB 2.0 Port

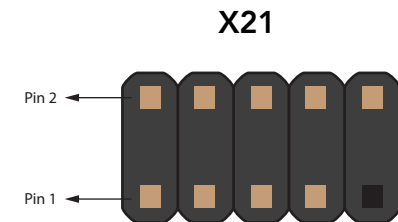
The conga-IC370 provides a USB 2.0 front panel header X21. The header supports two USB 2.0 ports. Each port supports a maximum current of 1 A.

Table 26 X21 Pinout Description

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

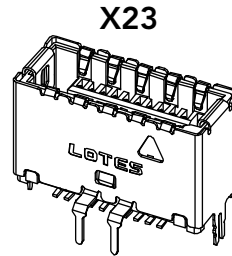
Connector Type

X21: 2.54 mm, 2 x 5-pin header



5.4.4 Internal USB 3.1 Gen 2 Port

The conga-IC370 provides a USB 3.1 front panel connector X23. The connector supports a USB 3.1 Type-C or Type-A port with appropriate cable adapter. The port supports a maximum current of 3 A in runtime mode and 1.5 A in suspend or standby mode.



Note

1. For USB 3.1 Gen 2 speed (10 Gbps), use internal USB cables of 50 cm or less.
2. X23 supports only 5 V power source for USB 3.1 Type-C



Connector Type

X23: 20-pin USB3.1 Internal Front Panel, Key-A

5.5 SATA Connectors

The conga-IC370 provides two standard SATA 3.0 ports, an M.2 key B socket and a SATA power header.

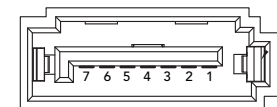
5.5.1 Standard SATA Port

The conga-IC370 provides two standard SATA 3.0 ports (X13 and X16). The port supports:

- SATA Gen 3 Specification with up to 6 Gb/s
- SATA or SATADOM with appropriate cable
- pin 7 power source for SATADOMs (disabled in the BIOS setup menu by default)
- pin 8 power source for SATADOMs

To show SATA port activity, connect an LED to pin 1 and 3 of the front panel connector X47.

X13, X16





- Note**
1. Enable pin 7 power source in the BIOS setup menu under "Chipset ->Platform Controller Hub -> SATA and RST Configuration -> SATADOM Power Pin 7" and select "SATADOM".
 2. To use pin 8 power source or a standard SATA HDD/SSD, disable pin 7 power source in the BIOS setup menu under "Chipset ->Platform Controller Hub -> SATA and RST Configuration -> SATADOM Power Pin 7" and select "SATA SSD/HDD".

Connector Type

X13, X16: Standard SATA connector

5.5.2 M.2 Key B Socket

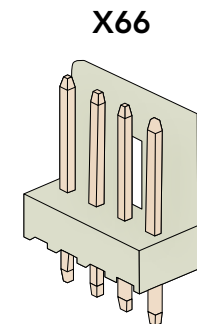
The conga-IC370 provides an M.2 key B, Type 2242/2280 socket (X64) for connecting SATA SSD cards. Refer to section 5.2.3 "M.2 Key B Socket" for X64 pinout description.

5.5.3 SATA Power Header

The conga-IC370 provides a 4-pin SATA power connector (X66) for 2.5" HDD or SSD. The header supplies 5 V or 12 V with 1.5 A maximum current.

Table 27 X66 Pinout Description.

Pin	Signal
1	5 V (maximum 1.5 A)
2	GND
3	GND
4	12 V (maximum 1.5 A)



Connector Type

X66: 2.5 mm pitch, 4-pin header (TE 171825-4)

Possible Mating Connector: TE 171822-4

5.5.4 Optional SATADOM Power Connector

The conga-IC370 offers two optional connectors with 5 V (assembly option) for SATADOM devices that do not support SATADOM pin 7 or pin 8 power technology.

5.6 Ethernet

The conga-IC370 provides one gigabit Ethernet (X5) and one 2.5 Gb Ethernet (X6). X5 interface is equipped with Intel i219-LM controller and supports Intel vPro/AMT technology. X6 interface is equipped with Intel i225-LM controller by default but can be equipped with Intel i255-V by assembly option.

The built-in LEDs indicate the status of the LAN.

Table 28 X5 LED Description

LED	Color	Description
Left LED	Off	10 Mbps link speed
	Green	100 Mbps link speed
	Orange	1 Gbps link speed
Right LED	Off	No link
	Steady on	Link established, no activity detected
	Blinking	Link established, activity detected

X5/X6

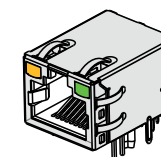


Table 29 X6 LED Description

LED	Color	Description
Left LED	Off	No link
	Steady on	Link established, no activity detected
	Blinking	Link established, activity detected
Right LED	Off	10 Mbps or 100 Mbps link speed
	Green	1 Gbps link speed
	Orange	2.5 Gbps link speed

Note

1. X5 interface supports Intel vPro/AMT technology and IEEE 1588
2. X6 interface supports TSN

Connector Type

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

X6: 8-pin RJ45 connector with 2.5 Gb magnetic and LEDs

5.7 Audio Connectors

The conga-IC370 features a high definition audio codec (Realtek ALC888S). The signals are routed to internal and rear audio connectors. The rear connectors are Line-OUT and Mic-IN. The internal connectors are stereo speaker, digital microphone, SPDIF and front Panel HD audio.

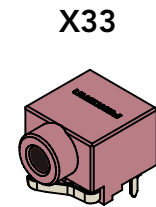
The driver for the codec is available on congatec website at www.congatec.com.

5.7.1 Rear Audio

The conga-IC370 provides MIC-IN (X33) and line-OUT (X34) connectors.

Table 30 X33 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 Jack

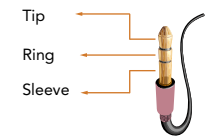
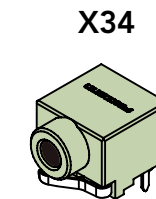
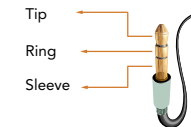


Table 31 X34 Pinout Description

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



Line-Out Jack



Connector Type

X33, X34: 3-pin, 3.5 mm single audio jack

5.7.2 Internal Audio

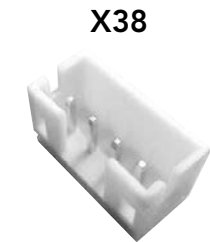
The conga-IC370 provides the stereo speaker, digital microphone, SPDIF and front panel HD audio connectors internally.

5.7.2.1 Stereo Speaker Header

The conga-IC370 provides stereo speaker header X38. Each audio channel offers a maximum wattage of 6 W into 4 ohms. You can connect 4 ohm or 8 ohm stereo speakers to X38.

Table 32 X38 Pinout Description

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



Connector Type

X38: 2 mm, 4-pin crimp style connector

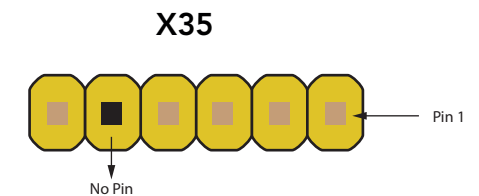
Possible Mating connector: JST PHR-4 or Chyao Shiunn JS-1124-04

5.7.2.2 Digital Microphone Header

The conga-IC370 provides a digital microphone (DMIC) header X35. The maximum power budget is 500 mA.

Table 33 X35 Pinout Description

Pin	Signal	Description
1	+3.3V	3.3 V supply
2	DMIC_DATA	Serial data from digital MIC (3.3 V signal level)
3	GND	Ground
4	DMIC_CLK	Digital MIC serial clock (3.3 V signal level)
5	KEY	No pin
6	N.C	Not connected



Connector Type

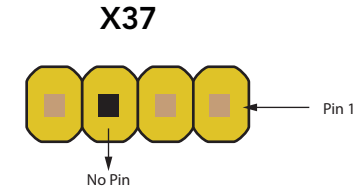
X35: 2.54 mm, 1x 6-pin header (without pin 5)

5.7.2.3 S/PDIF Header

The conga-IC370 provides an S/PDIF output header X37.

Table 34 X37 Pinout Description

Pin	Signal	Description
1	GND	Ground
2	SPDIFOUT	S/PDIF output (3.3 V)
3	KEY	No pin
4	+5 V	+5 V supply



Connector Type

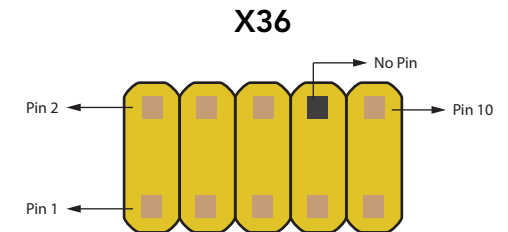
X37: 2.54 mm, 1x 4-pin header (without pin 3)

5.7.2.4 Front Panel Header

The conga-IC370 provides a front panel header X36. The header support line or headphone output, and microphone input.

Table 35 X36 Pinout Description

Pin	Signal	Description
1	MIC2_L	2nd analog stereo microphone input—left channel
2	A_GND	Analog 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 path to A_GND
7	SENSE	Jack detection path to HDA codec for MIC2 and LINE2
8	KEY	No pin
9	LINE2_L	2nd analog line output—left channel (headphone)
10	LINE2_JD	Line output jack detection path to A_GND



Connector Type

X36: 2.54 mm, 2x 5-pin header (without pin 8)

5.8 COM Port Headers

The conga-IC370 provides four COM ports—two ports (COM 1, COM 2) from LPC to UART bridge and two ports (COM 3, COM 4) from the Congatec board controller (cBC).

5.8.1 COM 1 and 2 (RS232/RS422/RS484)

The LPC to UART bridge on the conga-IC370 provides two COM ports—COM 1 and COM 2. COM port 1 provides RS232 COM port on pin header X39 or RS422/RS484 COM port on pin header X41. COM port 2 provides RS232 COM port on pin header X40 or RS422/484 COM port on pin header X42.

Use the BIOS setup menu to select the serial communication standard (RS232, RS422 or RS484) for each COM port. The RS485 mode has Tx output control and Rx echo cancellation.

Table 36 X39, X40 Pinout Description

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

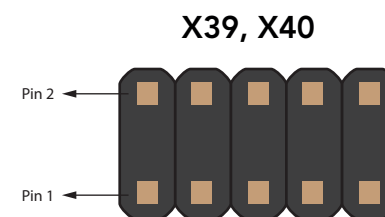
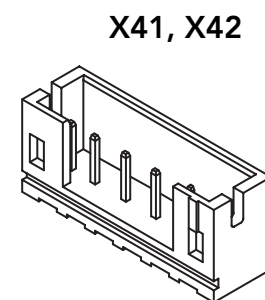


Table 37 X41, X42 Pinout Description

Pin	Signal	Description
1	TX-	Transmit data -
2	TX+	Transmit data +
3	RX-	Receive data -
4	RX+	Receive data +
5	GND	Ground



Note

1. If 120 ohm bus termination is required, add a termination resistor to the cable or cable adapter.
2. For 2-wire RS485 (X41 and X42), externally connect pin 1 to pin 3 and pin 2 to pin 4.

Connector Type

X39, X40: 2.54 mm, 2 x 5-pin headers

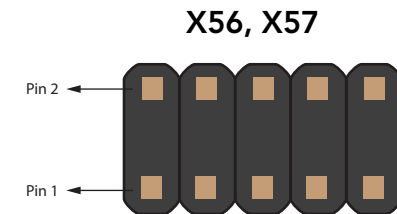
X41, X42: 2 mm, 5-pin JST B5B-PH-SM4-TB connector; Possible Mating Connector: JST PHR-5

5.8.2 COM 3 and 4 (RS232)

The conga-IC370 provides RS232 COM 3 on pin header X56 and RS232 COM 4 on pin header X57.

Table 38 X56, X57 Pinout Description

Pin	Signal	Description	Pin	Signal	Description
1	N.C	Not connected	2	RXD	Received Data
3	TXD	Transmit Data	4	N.C	Not connected
5	GND	Ground	6	N.C	Not connected
7	RTS	Request to Send	8	CTS	Clear to Send
9	N.C	Not connected	10	N.C	Not connected



Connector Type

X56, X57: 2.54 mm, 2 x 5-pin headers

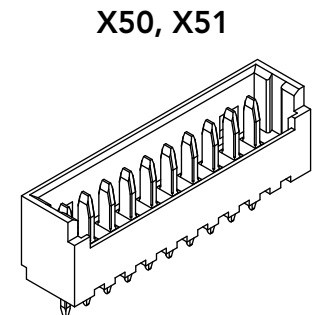
5.9 GPIO Header

The conga-IC370 provides GPIO headers X50 and X51. The GPIOs are sourced from the board controller. Each header offers eight GPIO signals and 3.3 V provided through a 500mA resettable fuse.

The GPIO signals have 3.3 V level with internal 10 k Ω board controller pull-up resistors.

Table 39 X50, X51 Pinout Description

Pin	X50	X51	Description
1	GPIO_0	GPIO_8	General Purpose Input Output 0 or 8
2	GPIO_1	GPIO_9	General Purpose Input Output 1 or 9
3	GPIO_2	GPIO_10	General Purpose Input Output 2 or 10
4	GPIO_3	GPIO_11	General Purpose Input Output 3 or 11
5	GND	GND	Ground
6	GPIO_4	GPIO_12	General Purpose Input Output 4 or 12



7	GPIO_5	GPIO_13	General Purpose Input Output 5 or 13
8	GPIO_6	GPIO_14	General Purpose Input Output 6 or 14
9	GPIO_7	GPIO_15	General Purpose Input Output 7 or 15
10	+ 3.3 V	+ 3.3 V	3.3 V supply (standby)

Connector Type

X50, X51: 10-pin, 1.25 mm pitch picoblade header (Molex 530471010)

Possible Mating Connector: Molex 0510211000

5.10 I²C Bus/SM Bus Header

The conga-IC370 provides two pin headers (X43 and X52) for I²C/SM bus signals. Pin header X43 supports 5 V signal level while pin header X52 supports 3.3 V signal level.

Table 40 X43 Pinout Description

Pin	Signal	Voltage Level	Description
1	I2C_DAT	5 V	I2C data
2	GND		Ground reference
3	I2C_CLK	5 V	I2C clock output
4	+ 5 V		+5 V runtime power output with 500 mA fuse
5	SMB0_DAT	5 V	SMBus data
6	GND		Ground reference
7	SMB0_CLK	5 V	SMBus clock output
8	+5 V		+5 V runtime power output with 500 mA fuse

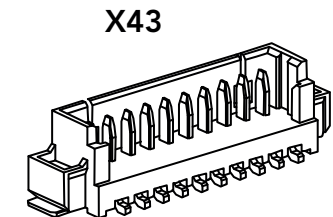
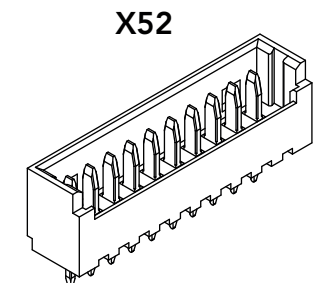


Table 41 X52 Pinout Description

Pin	Signal	Voltage Level	Description
1	PM_THRM#		Thermal event from external sensor (should be driven by open drain/collector output)
2	I2C_DAT	3.3 V	I2C data
3	GND		Ground reference
4	I2C_CLK	3.3 V	I2C clock output
5	+3.3 V ¹		+3.3 V standby power output with 500 mA fuse
6	SMB0_ALERT#		SM bus alert signal from external device (should be driven by open drain/collector output)
7	SMB0_DAT	3.3 V	SMBus data



8	GND		Ground reference
9	SMB0_CLK	3.3 V	SMBus clock output
10	+ 3.3 V ²		+3.3 V standby power (deep) output with 500 mA



- Note**
- ¹ Recommended for I2C devices.
 - ² Recommended for SM bus devices.

Connector Type

X43: 8-pin, 1.25 mm pitch picoblade header (Molex 0533981071)
 X52: 10-pin, 1.25 mm pitch picoblade header (Molex 530471010)
 Possible Mating Connector: Molex 510211000

5.11 Front Panel Header

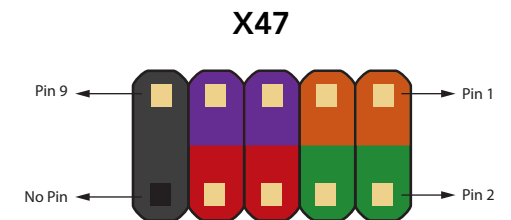
The conga-IC370 provides pin header X47 for front panel features such as reset and power buttons, power state bidirectional LED and SATA LED. Pins 2 and 4 indicate the conga-IC370 power states. For LED status description, see section 5.1.3 “Power Status LEDs”.

Table 42 X47 Pinout Description

Pin	Signal	Description
1	HDD_LED+	SATA activity LED (anode) driven by 5 V with 470 ohm resistor
2	FP_LED+	Power LED (anode for main color, cathode for alternate color) driven by 3.3 V with 330 ohm resistor
3	HDD_LED-	SATA activity LED (cathode) driven by 5 V with 470 ohm resistor
4	FP_LED-	Power LED (cathode for main color, anode for alternate color) driven by 3.3 V with 330 ohm resistor
5	GND	Ground
6	PWRBTN#	Power Button (Note: for proper detection, assert a pulse width of at least 16 ms)
7	SYS_RST#	Reset Button (Note: for proper detection, assert a pulse width of at least 16 ms)
8	GND	Ground
9	+5 V	+5 V runtime power supply (500 mA power budget)
10	KEY	No pin

Connector Type

X47: 2.54 mm, 10-pin header (without pin 10)



5.12 CPU and System Fan Header

The conga-IC370 provides pin header X54 for connecting CPU fan and pin header X55 for connecting system fan. The headers support 3-pin or 4-pin 12V fan. The recommended maximum power rating for the fan is 4W.

Table 43 X54 Pinout Description

Pin	Signal
1	GND
2	+12 VDC (maximum 500 mA)
3	CPU_FAN_TACHOIN
4	CPU_FAN_CTRL

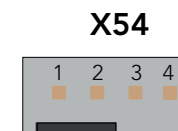
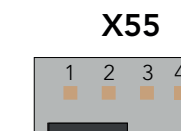


Table 44 X55 Pinout Description

Pin	Signal
1	GND
2	+12 VDC (maximum 500 mA)
3	AUX_FAN_TACHOIN
4	AUX_FAN_CTRL



Note

1. The connector and pinout complies with 4-Wire Pulse PWM Controlled Fans Specification, Revision 1.3
2. FAN_TACHOIN fan output shall provide two pulses per revolution.
3. The fan must pull-up the FAN_CTRL signal to high logic level

Connector Type

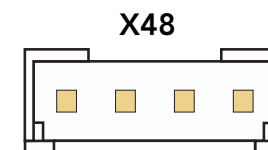
X54, X55: 2.54 mm, 4-pin header

5.13 Sleep and Lid Button Header

The conga-IC370 provides pin header X48 for sleep button and lid switch functionality.

Table 45 X48 Pinout Description

Pin	Signal	Description
1	LID_BTN#	Lid button (active low, triggers sleep state or wake up from sleep). Connect directly to LID switch, active low
2	GND	Ground
3	SLP_BTN#	Sleep button (active low, triggers sleep state). Connect directly to sleep button, active low
4	GND	Ground



Connector Type

X48: 2.54 mm, 1 x 4-pin header (Molex 530470410)

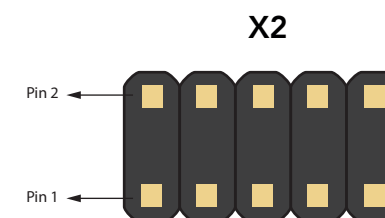
Possible Mating Connector: Molex 510210400

5.14 External BIOS Flash

With pin header X2, the conga-IC370 can boot from an external 3.3 V SPI flash. For external BIOS flash, you need a PCB adapter (with an SPI flash) that connects to X2. For more information, contact congatec support.

Table 46 X2 Pinout Description

Pin	Signal	Description	Pin	Signal	Description
1	SPI_CS0#	SPI flash CS# pin	2	VDD	Power supply (3.3V)
3	SPI_IO1	SPI flash MISO pin	4	SPI_IO3	SP flash HOLD# pin
5	SPI_IO2	SPI flash WP# pin	6	SPI_CLK	SPI flash clock input
7	GND	Ground	8	SPI_IO0	SPI flash MOSI pin
9	BIOS_EXT#	Enable booting from external SPI flash (active low)	10	SER1_TX	Serial port debug output from cBC



Connector Type

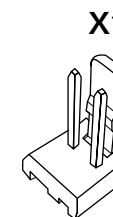
X2: 1.27 mm, 2 x 5-pin header

5.15 Chassis Intrusion Connector

The conga-IC370 provides pin header X1 for chassis intrusion detection. Connect normally-open switch to X1.

Table 47 X1 Pinout Description

Pin	Function
1	GND
2	INTRUDER#



Connector Type

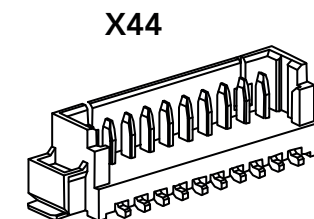
X1: 2.54 mm, 2-pin connector (Molex 22-27-2021)

5.16 Feature Header

The conga-IC370 provides pin header X44 for various functions.

Table 48 X44 Pinout Description

Pin	Signal	Pin Type	Voltage Level	Termination	Description
1	N.C				Not connected (assembly option for PWROK input signal)
2	BATLOW#	Input	3.3 V standby	PU 10 k	Battery low (active low; indicates low external battery) Use open drain configuration on external device
3	SDP	Output			SDP output from Intel I225 controller (for time synchronization (IEEE 1588))
4	WDTRIG	Input	3.3 V	PU 10 k	Watchdog trigger input (board controller), timer reset, active low. Use open drain configuration on external device
5	GND				Ground
6	SLP_S3#	Output	3.3 V standby		S3 sleep control (suspend to RAM), active low
7	SLP_S4#	Output	3.3 V standby		S4 sleep control (suspend to Disk), active low
8	SLP_S5#	Output	3.3 V standby		S5 sleep control (Soft Off), active low
9	WDOUT	Output	3.3 V	PD 100 k	Watchdog output event (board controller)
10	3.3 V	Power			3.3 V standby power output (500 mA max)



Connector Type

X44: 10-pin, 1.25 mm pitch picoblade header (Molex 0533981071)

Possible Mating Connector: Molex 510211000

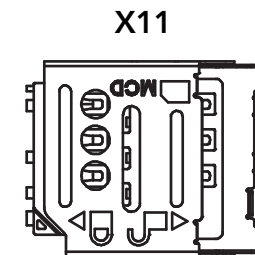
6 Additional Features

6.1 Micro-SIM Card

The conga-IC370 offers a top-entry micro-SIM slot X11 for inserting SIM card.

Table 49 X11 Pinout Description

Pin	Signal	Description
C1	PWR	Power
C2	RST	Reset
C3	CLK	Clock
C4	N.A	Not available
C5	GND	Ground
C6	N.C	Not connected
C7	I/O	Data
C8	N.A	Not available



Note

1. The micro-SIM card slot is connected to M.2 key B socket X64 by default.
2. The slot can optionally be routed to mini card socket X9 (assembly option).



Connector Type

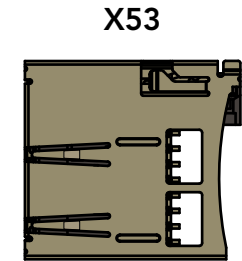
X11: Micro-SIM card socket

6.2 Micro-SD Card

The conga-IC370 offers a micro-SD slot on X53. The SD card slot complies with SDXC card specification 3.01 with support for up to 104 MBps data rate. The slot is located at the bottom-side.

Table 50 X53 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)



Connector Type

X53: Micro-SD card slot

6.3 Security Features

The conga-IC370 features a firmware TPM (Intel PTT TPM 2.0) as well as a discrete Infineon SLB9670 TPM 2.0.



To use the discrete TPM module, disable the firmware TPM (fTPM) in the Advanced ->Platform Trust Technology -> fTPM BIOS setup submenu.

6.4 Beeper

The onboard magnetic buzzer M22 provides audible error code (beep code) information during POST.

6.5 congatec Board Controller (cBC)

The conga-IC370 is equipped with a Microchip MEC1705 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, I²C bus from the x86 core architecture. The isolation helps improve performance and reliability even when the x86 processor is in a low power mode.

6.5.1 Fan Control

The cBC uses the PWM (FAN_PWMOUT) signal to adjust the rotational speed of the fan without changing the fan's input voltage. Additionally, the FAN_TACHOIN signal provides the ability to monitor the system's fan RPMs (revolutions per minute). For accurate RPM reading, the FAN_TACHOIN signal must receive two pulses per revolution. Therefore, a two pulse per revolution fan or similar hardware solution is recommended.

6.5.2 Power Loss Control

The cBC has full control of the power-up of the SBC; therefore, it 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".

6.5.3 Board Information

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

6.6 OEM BIOS Customization

The conga-IC370 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 customization features supported are described below:

6.6.1 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.

6.6.2 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 AN11_Create_And_Add_Bootlogo.pdf on the congatec website for details on how to add OEM boot logo to the congatec Embedded BIOS.

6.6.3 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 or add the OEM POST logo.

6.6.4 OEM BIOS Code/Data

With the congatec embedded BIOS, system designers can add their code to the BIOS POST process. The congatec Embedded BIOS first calls the OEM code before handing over control to the OS loader. Except for custom specific code, this feature can also be used to support verb tables for HDA codecs, PCI/PCIe OpROMs, bootloaders and rare graphic modes.



The OEM BIOS code of the new UEFI based firmware is called only when the CSM (Compatibility Support Module) is enabled in the BIOS setup menu. Contact congatec technical support for more information on how to add OEM code.

6.6.5 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.

6.7 congatec Battery Management Interface

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 (for example, charge state of the battery, information about the battery, alarms/events for certain battery states and so on) without the need for additional modifications to the system BIOS.

In addition to the ACPI-Compliant Control Method Battery mentioned above, the latest versions of the conga-IC370BIOS 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.

6.8 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, 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, available on the congatec website.

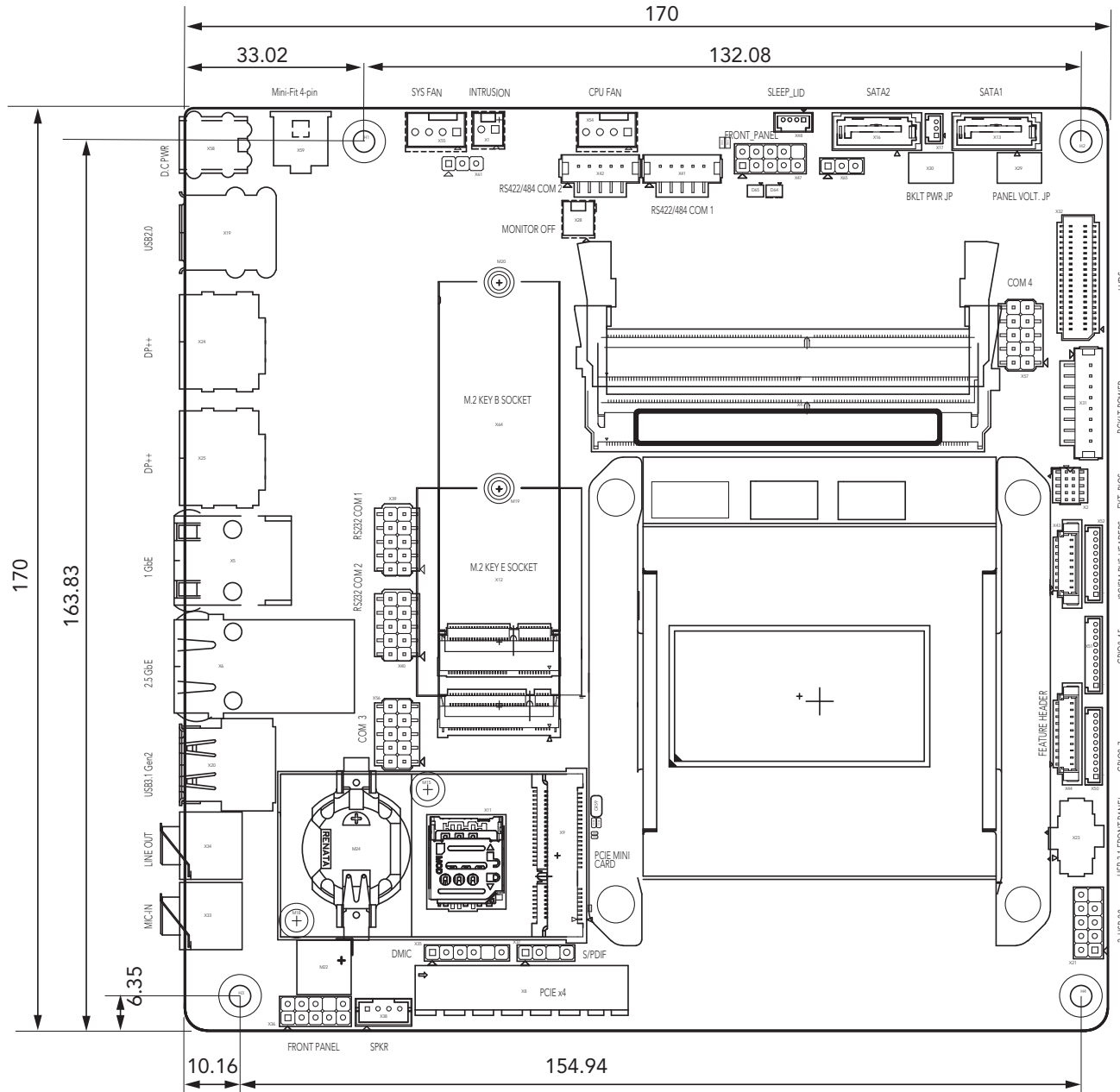
6.9 Thermal and Voltage Monitoring

The cBC monitors the ambient temperature, input voltage and input current of the conga-IC370. The sensors in the CPU monitor the CPU temperature.

6.10 External System Wake Event

The conga-IC370 supports LAN, USB, power,lid, sleep buttons and PCIe driven wake-up events.

7 Mechanical Drawing



8 BIOS Setup Description

The BIOS setup description of the conga-IC370 can be viewed without having access to the module. However, access to the restricted area of the congatec website is required in order to download the necessary tool (CgMlfViewer) and Menu Layout File (MLF).

The MLF contains the BIOS setup description of a particular BIOS revision. The MLF can be viewed with the CgMlfViewer tool. This tool offers a search function to quickly check for supported BIOS features. It also shows where each feature can be found in the BIOS setup menu.

For more information, read the application note "AN42 - BIOS Setup Description" available at www.congatec.com.



If you do not have access to the restricted area of the congatec website, contact your local congatec sales representative.

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 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-IC370 is identified as IWCLR1xx or IUCLR1xx, 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 binary size for IWCLR and IUCLR is 32 MB.

8.3 Updating the BIOS

BIOS updates are recommended to correct platform issues or enhance the feature set of the module. The conga-IC370 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 line¹, 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*



Caution

The DOS command line tool is not officially supported by congatec and therefore not recommended for critical tasks such as firmware updates. We recommend to use only the UEFI shell for critical updates.

8.4 Supported Flash Devices

The conga-IC370 supports:

- Winbond W25Q256JVEIQ (32 MB)
- GigaDevice GD25B256DYIG (32 MB)
- Macronix MX25L25645G (32 MB)

The flash devices above can be used 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>.