

conga-IA3 Thin Mini-ITX SBC

Detailed Description Of The congatec Thin Mini-ITX Based On 3rd Generation Intel Atom/Celeron SoC

User's Guide

Revision 0.1 (**Preliminary**)

Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
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Preface

This user's guide provides information about the components, features and connectors available on the conga-IA3 Thin Mini-ITX Single Board Computer.

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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.

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Terminology

Term	Description
PCI Express (PCIe)	Peripheral Component Interface Express – next-generation high speed Serialized I/O bus
PCI Express Lane	One PCI Express Lane is a set of 4 signals that contains two differential lines for Transmitter and two differential lines for Receiver. Clocking information is embedded into the data stream.
x1, x2, x4, x16	x1 refers to one PCI Express Lane of basic bandwidth; x2 to a collection of two PCI Express Lanes; etc.. Also referred to as x1, x2, x4 or x16 link.
PCI Express Mini Card	PCI Express Mini Card add-in card is a small size unique form factor optimized for mobile computing platforms.
MMCplus	MMCplus was defined for first time in MMC System Specification v4.0. MMCplus is backward compatible with MMC. MMCplus has 13 pins.
SDIO card	SDIO (Secure Digital Input Output) is a non-volatile memory card format developed for use in portable devices.
USB	Universal Serial Bus
SATA	Serial AT Attachment: serial-interface standard for hard disks
HDA	High Definition Audio
S/PDIF	S/PDIF (Sony/Philips Digital Interconnect Format) specifies a Data Link Layer protocol and choice of Physical Layer specifications for carrying digital audio signals between devices and stereo components.
HDMI	High Definition Multimedia Interface. Supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.
TMDS	Transition Minimized Differential Signaling. TMDS is a signaling interface defined by Silicon Image that is used for DVI and HDMI.
DVI	Digital Visual Interface is a video interface standard developed by the Digital Display Working Group (DDWG).
LPC	Low Pin-Count: a low speed interface used for peripheral circuits such as Super I/O controllers, which typically combine legacy device support into a single IC.
I ² C Bus	Inter-Integrated Circuit Bus: is a simple two-wire bus with a software-defined protocol that was developed to provide the communications link between integrated circuits in a system.
SM Bus	System Management Bus: is a popular derivative of the I ² C-bus.
CAN	Controller Area Network
SPI	Serial Peripheral Interface
GBE	Gigabit Ethernet
LVDS	Low-Voltage Differential Signaling
DDC	Display Data Channel is an I ² C bus interface between a display and a graphics adapter.
PN	Part Number - the part number for placing orders.
N.C	Not connected
N.A	Not available
T.B.D	To be determined

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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 170mm x170mm, 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-IA3

The conga-IA3 is a Single Board Computer designed based on the Thin Mini-ITX specification. The conga-IA3 SBC features the Intel 3rd generation Atom/Celeron processors. With maximum 10W TDP processors, the SBC offers Ultra Low Power boards with high computing performance and outstanding graphics. Additionally, the SBC supports dual channel DDR3L up to 1333 MT/s for a maximum system memory capacity of 16 GB, multiple I/O interfaces, up to two independent displays and various congatec embedded features.

With smaller board size and lower height keep-out zones, the conga-IA3 SBC provides manufacturers and enthusiasts with the opportunity to design compact systems for space restricted areas. With appropriate I/O shield, the same conga-IA3 SBC can be used in either a Thin Mini-ITX or a Mini-ITX design.

The various features and capabilities offered by the conga-IA3 makes it ideal for the design of compact, energy efficient, performance-oriented embedded systems.

1.2.1 Options Information

The conga-IA3 is currently available in four variants. This user's guide describes all of these variants. The tables below show the different configurations available. Check for the Part No. that applies to your product. This will tell you what options described in this user's guide are available on your particular module

conga-IA3

Part-No.	052300	052301	052310	052311
Processor	Intel® Atom™ E3845 1.91 GHz Quad Core™	Intel® Atom™ E3826 1.46 GHz Dual Core™	Intel® Celeron™ J1900 2.0 GHz Quad Core™	Intel® Celeron™ N2930 1.83 GHz Quad Core™
L2 Cache	2 MByte	1 MByte	2 MByte	2 MByte
Burst Frequency	N/A	N/A	2.41 GHz	2.16 GHz
Memory (DDR3L)	1333 MT/s dual channel	1066 MT/s dual channel	1333 MT/s dual channel	1333 MT/s dual channel
Processor Graphics	Intel® HD Graphics (GT1)	Intel® HD Graphics (GT1)	Intel® HD Graphics (GT1)	Intel® HD Graphics (GT1)
Graphics Base/Burst Freq.	542 / 792 MHz	533 / 667 MHz	688 / 854 MHz	313 / 854 MHz
VGA	No	No	No	No
LVDS	Single/Dual 18/24bit	Single/Dual 18/24bit	Single/Dual 18/24bit	Single/Dual 18/24bit
DDI	DP / HDMI / DVI	DP / HDMI / DVI	DP / HDMI / DVI	DP / HDMI / DVI
Processor TDP (Max)	10 W	7 W	10 W	7.5 W *

* Scenario Design Power (SDP) of 4.5W

1.2.2 Optional Accessories/Cables

Accessories	Part No.	Description
conga-IA30/CSP	052351	Passive cooling solution with Thin Mini-ITX height (for conga-IA3)
conga-IA30/Retention Frame	052355	Retention frame for conga-IA3 standard cooling
conga-IA30/IO Bracket Standard Size	052356	IO shield for conga-IA3 with Mini-ITX height
conga-IA30/IO Bracket Thin Size	052357	IO shield for conga-IA3 with Thin Mini-ITX height
DDR3L-SODIMM-1600 (2 GB)	068755	Certified 2 GB DDR3L SODIMM memory module with 1600 MT/s (PC3L-12800S)
DDR3L-SODIMM-1600 (4 GB)	068756	Certified 4 GB DDR3L SODIMM memory module with 1600 MT/s (PC3L-12800S)
DDR3L-SODIMM-1600 (8 GB)	068757	Certified 8 GB DDR3L SODIMM memory module with 1600 MT/s (PC3L-12800S)

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 2x5 pin female housing and D-Sub Male connector.
cab-ThinMini-ITX-USB2.0-Single	14000122	USB 2.0 cable with 1x5 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-USB3.0-Twin	14000124	USB 3.0 cable with Twin USB 3.0 Type A female connector and 2x10 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-ThinMini-ITX-LVDS	14000129	ACES 50204-40 LVDS cable for Thin Mini-ITX.
cab-DP to HDMI	14000128	20 pin male DisplayPort to 19 pin female HDMI
cab-ThinMini-ITX-SATA-Power (50cm lenght)	14000135	50cm SATA power cable with 2x15 pin female connectors.
cab-ThinMini-ITX-SATA-Power (30cm length)	14000136	30cm SATA power cable with 2x15 pin female connectors.
SATA III cable (straight/straight)	48000029	30cm SATA III data cable with straight/straight connectors
SATA III cable (straight/right-angled)	48000030	30cm SATA III data cable with straight/right-angled connectors

2 Specification

2.1 Feature List

Table 1 Feature Summary

Form Factor	Based on Thin Mini-ITX form factor (170 x 170 mm).	
Processor	Intel® 3 rd Generation Atom/Celeron SoC	
Memory	2x SO-DIMM dual channel non-ECC DDR3L memory, up to 1333 MT/s with 16GB maximum capacity. Sockets located top side of module.	
cBC	Multi-stage watchdog, non-volatile user data storage, manufacturing and board information, board statistics, I2C bus, Power loss control.	
Chipset	Integrated in the SoC	
Audio	Realtek ALC888s 7.1 channel High Definition Audio codec	
Ethernet	2x Gigabit Ethernet support via the onboard Intel® I210/I211 Phy.	
Graphics	Intel® HD Graphics with support for DirectX11, OpenGL 3.0, OpenCL 1.2, OpenGLES 2.0, full HW acceleration for decode/encode of MPEG2, H.264, MVC and dual simultaneous display support and support for dual simultaneous displays.	
Graphic Interfaces	1x DD1 (DP, HDMI/DVI) and 1x eDP/LVDS	
Back Panel I/O Connectors	1x DisplayPort ++ (DP++). Supports DP/DVI/HDMI <ul style="list-style-type: none"> - 1x HDMI 1.4: Multiplexed with DisplayPort (DP)/DVI. Hot-plug detect support. - 1x DVI: Multiplexed with HDMI/DP ports. Hot-Plug detect support. 1x VGA	1x Audio OUT/MIC 2x Gigabit Ethernet (without AMT) 2x USB 2.0 2x USB 3.0 1x DC-IN
Onboard I/O Connectors	1x LVDS (top side) 1x eDP interface (bottom side) 1x Backlight 1x Monitor OFF SATA Interfaces <ul style="list-style-type: none"> - 2x Standard SATA II (3.0 Gb/s). - 1x mini SATA II (shared with mini PCIe Slot) - 1x SATA power header connector (3.3V, 5V or 12V) PCI Express Interfaces <ul style="list-style-type: none"> - 1x PCI Express® Slot (x1 Gen 2 link). - 1x Half size mini PCIe Slot - 1x Full size mini PCIe Slot (shared with mSATA) - optional SIM card slot via connector X6 (Full size mPCIe/mSATA) 2x USB 2.0 2x USB 3.0	1x MicroSD slot (located at the bottom side) 1x Front panel HD audio 1x SPDIF/Digital microphone 1x Stereo speaker Connectors supported via Super IO <ul style="list-style-type: none"> - 2x COM ports (COM 1 can be used optionally as ccTALK) - 1x CPU fan with selectable voltage - 1x System fan with selectable voltage - 1x Case Open Intrusion Detection header - GPOs on feature connector Feature connector (GPIOs, SPI, SMB, LPC, LID/SLEEP etc) 1x Front panel header (Power button, reset, LEDs etc) 1x optional SBM ³ support header 1x Internal power header (12-24V) 1x optional SBM ³ power
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 2.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). Configurable TDP Ultra low standby power consumption, Deep Sx.
Security	Optional discrete Trusted Platform Module "TPM 1.2/2.0", new AES Instructions for faster and better encryption.



Note

Some of the features mentioned in the above feature summary are optional. Check the article number of your module and compare it to the option information list on page 11 of this user's guide to determine what options are available on your particular module.

2.2 Supported Operating Systems

The conga-IA3 supports the following operating systems.

- Microsoft® Windows® 8
- Microsoft® Windows® 7
- Microsoft® Windows® 7/8 Embedded Standard
- Linux

2.3 Mechanical Dimensions

- 170mm x 170mm
- Height approximately 20mm

2.4 Environmental Specifications

Temperature Operation: 0° to 60°C Storage: -20° to +80°C

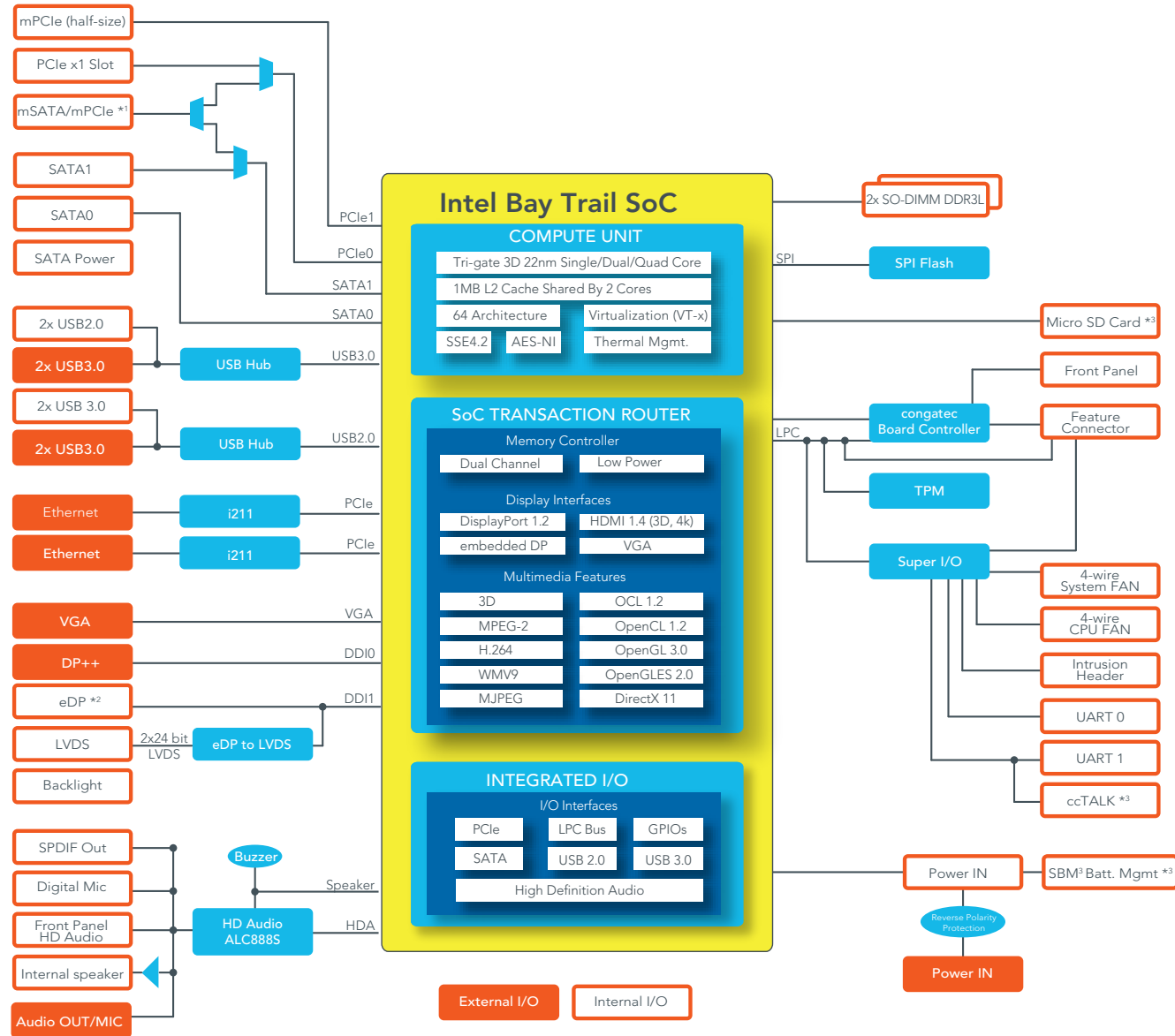
Humidity Operation: 10% to 90% Storage: 5% to 95%



Note

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

3 Block Diagram



*1 The mSATA/mPCIe connector supports both mPCIe and mSATA devices. The devices are detected automatically.

*2 Located at the bottom side.

*3 Optional feature.

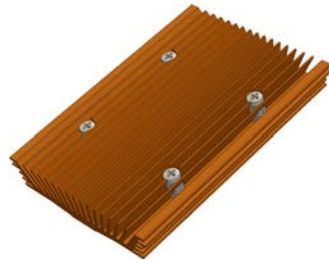
4 Cooling Solution

The conga-IA3 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. This means that for reliable operation, the thermal design of the conga-IA3 must be carefully considered. 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-IA3 is maintained.

congatec AG offers two cooling possibilities for the conga-IA3:

- A congatec heatspreader in combination with the conga-IA3 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. Refer to section 4.2 "Heatspreader Dimensions" for the dimensions of the congatec heatspreader.
- The use of a custom cooling solution in combination with the conga-IA3 retention frame.



Heatspreader



Retention Frame



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:

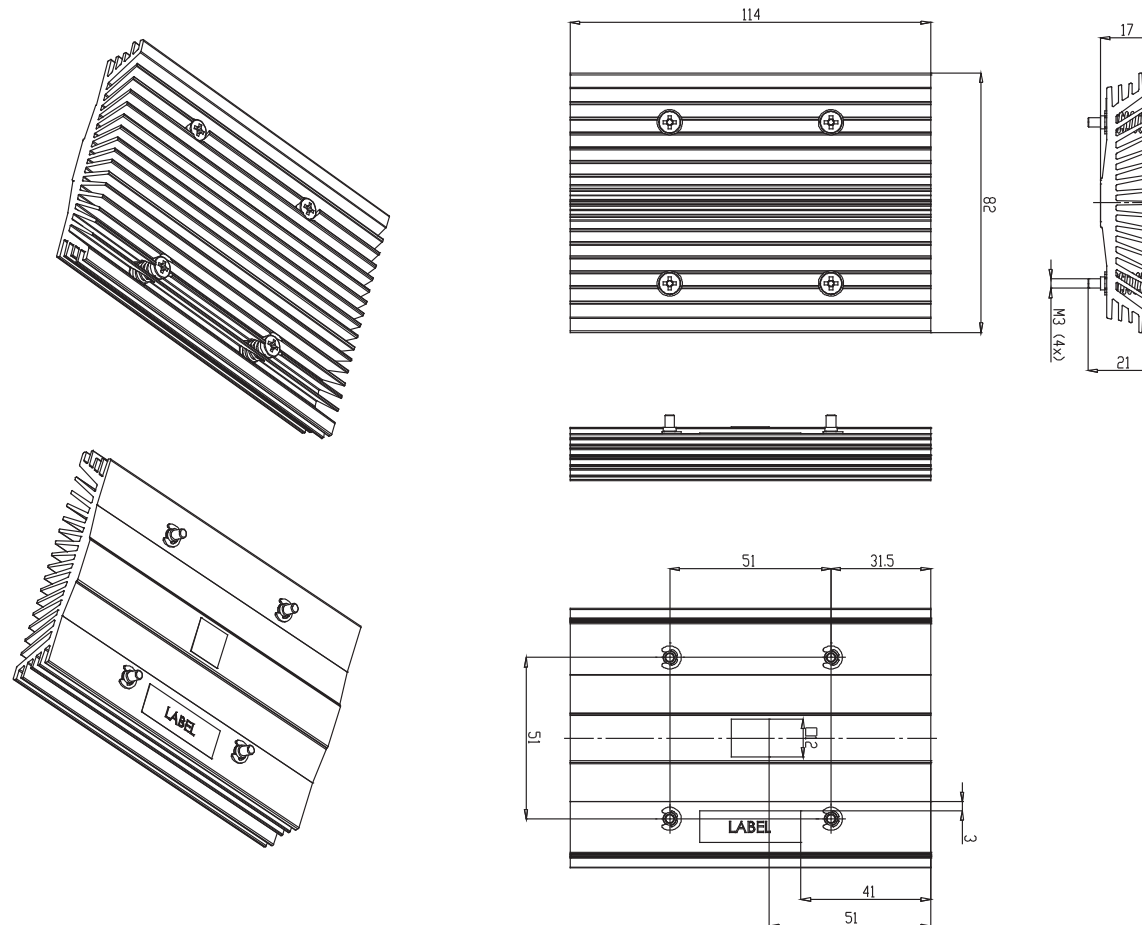
- Flip over the SBC and locate the position of the CPU
- Place retention frame on the bottom side of the board with insulating foil facing the PCB and standoffs inserted to PCB mounting holes.
- Remove the heatspreader's protection pull tab foil from the phase changer and carefully place the heatspreader to the CPU.
- Insert assembling screws.
- Hold the heatspreader with one hand so that it does not tilt while tightening the screws.
- Slightly tighten each of the 4 screws so that they hold the heatspreader in place. To do so, start with one screw and then slightly tighten the other screws in a crossover pattern. All the while keep holding the cooling adapter straight with one hand.
- Now you can fully tighten the screws. Once again start with one and then continue to tighten the other screws in a crossover pattern. All the while keep holding the cooling adapter straight with one hand



Caution

congatec cooling solutions have been specifically designed for use within commercial temperature ranges (0° to 60°C) only. It is the responsibility of the end user to design an optimized thermal solution that meets the needs of their application within the industrial environmental conditions it is required to operate in. Attention must be given to the mounting solution used to mount the cooling solution and SBC into the system chassis.

4.2 Heatspreader



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/ISO specifications.



Caution

When using the heatspreader in a high shock and/or vibration environment, congatec recommends the use of a thread-locking fluid on the cooling solution screws to ensure the above mentioned torque specification is maintained.

5 Connector Description

5.1 Power Supply

You can power the conga-IA3 SBC with a 12V-24V laptop type DC power supply (on connector X43) or a 4 pin internal power supply (on connector X44).

Additionally, the SBC offers an optional SBM³ power connector (only BOM option). When this connector (X45) is populated, you can power the SBC with it.



Note

The supplied voltages must be within a tolerance of $\pm 10\%$

5.1.1 DC Power Jack (Rear I/O)

The conga-IA3 SBC can be powered from a laptop type external power supply connected to the DC power jack on the rear I/O. This power input protects against polarity reversal and over/under voltage.

Connector X43 Pinout Description

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



Connector Type

X43 : DC Power Jack, 7.4x5.1mm Diameter



Note

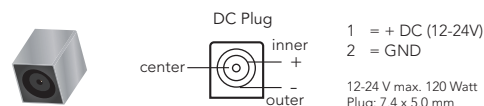
The default conga-IA3 BIOS configuration enables the system to boot-up immediately an external is supplied.



Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA3 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

DC Power Jack - Connector X43



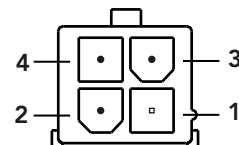
5.1.2 Power Supply (Internal Connector)

The conga-IA3 offers an internal 4-pin power connector. This connector makes it possible to use customized power supply cables/connector and also offers under/over voltage protection to the input voltage.

Connector X44 Pinout Description

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

Internal Power Connector X44



Connector Type

X44 : 4 Pos, Pitch 4.2mm Internal Power Connector (PN: 41500079).

Mating Connector: A possible mating connector for X44 is the Molex 39-01-2045.



Note

The default conga-IA3 BIOS configuration enables the system to boot-up immediately an external is supplied.



Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA3 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

5.1.3 Optional SBM³ Power Connector (Internal Connector)

You can also power the conga-IA3 SBC optionally with an SBM battery kit. The battery kit requires two connections - the SBM battery power on connector X50 and the SBM battery signals on connector X45. The SBM³ feature requires a firmware update.

Connector X50 Pinout Description

Pin	Function
1	+12 - 24V
2	+12 - 24V
3	GND
4	GND
5	NC



Connector Type

X50 : 1x5 Pos, 3mm Pitch Micro-FIT



Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA3 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

5.1.3.1 Optional SBM3 Signal Connector

As mentioned above, if you need the optional SBM battery power connector (X50), then you need in addition the optional SBM battery signals connector (X45) for adequate communication between the conga-IA3 and the battery kit.

Connector X45 Pinout Description

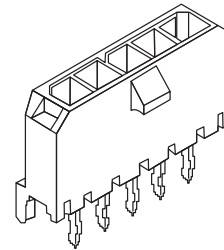
Pin	Function
1	GND
2	I2C_DAT
3	I2C_CLK
4	BATLOW#
5	SUS_STAT#
6	PM_SLP_S3#
7	PM_SLP_S5#
8	PWRBTN#



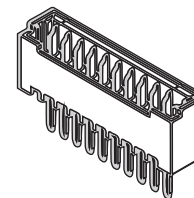
Connector Type

X45 : 1x8 Pos, 1.25mm Pitch PicoBlade

SBM3 Power - Connector X50



SBM3 Signal - Connector X45



5.1.4 PWR_OK Signal

With the PWR_OK signal on the feature connector (X34), the user can control the SBC's start-up process. When this signal is set to low, the SBC is kept in reset until the PWR_OK signal is asserted.

When the signal is asserted (set to high), it indicates to the SBC that the supplied power is stable. The SBC then begins its onboard power-up sequence.

5.1.5 Power Status LEDs

The conga-IA3 provides two LED signals (FP_LED1 and P_LED2) on pins 2 and 4 of the front panel connector X38. The signals indicate the different power states of the conga-IA3. Possible states and corresponding activity of the LEDs are shown below:

Double-Color Power LED

LED State	Description	ACPI State
Off	Power-off	S5
Steady Green	Running	S0
Steady Yellow	Sleeping	S3

Single-Color Power LED

LED State	Description	ACPI State
Off	Sleeping or power-off (not running)	S3, S5
Steady Green	Running	S0



Note

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

5.2 CMOS Battery/RTC

The conga-IA3 provides a board mounted battery holder (M29) 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.

M29 (Battery Holder)



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 Interfaces

The conga-IA3 provides audio connectors both internally and on the rear side. The internal audio connectors are stereo speaker, digital microphone/SPDIF and front Panel HD audio. The audio OUT/MIC connector is provided on the rear side.

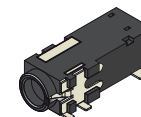
5.3.1 Rear Audio Connectors

The conga-IA3 has a high definition audio codec (Realtek ALC888S) mounted on it. The front channel line output signals and the MIC input signals are routed to connector X48 (audio OUT/MIC) on the rear side. The drivers for this codec can be found in the software section under conga-IA3 on the congatec website at www.congatec.com

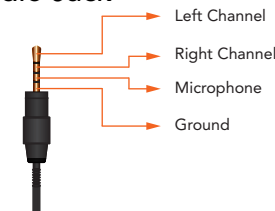
Audio OUT/MIC (Connector X48) Pinout Description

Pin	Plug	Signal	Description
1	Sleeve	A_GND	Analog Ground
2	Tip	FRONT_L	Front Analog Output Left Channel
3	Ring1	FRONT_R	Front Analog Output Right Channel
4	Ring2	MIC1_R/ MIC1_L	1st Microphone Analog Input Right Channel 1st Microphone Analog Input Left Channel
5	NA	SENSE_A	Jack Detect Pin 1
6	NA	SENSE_A	Jack Detect Pin 1

Audio OUT/MIC - Connector X48



Audio Jack



Connector Type

X48: 6 Pin, Single Audio Jack - black color

5.3.2 Internal Audio Connectors

The conga-IA3 provides the stereo speaker, digital microphone/SPDIF and front panel HD 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 via a TPA2012D2 amplifier to internal stereo speaker - connector X19. The amplifier offers a maximum wattage of 2.1W per channel into 4 ohms.

Stereo Speaker (Connector X19) Pinout Description

Pin	Signal	Description
1	OUTL-	Left Channel Negative Differential Output
2	OUTL+	Left Channel Positive Differential Output
3	OUTR-	Right Channel Negative Differential Output
4	OUTR+	Right Channel Positive Differential Output

Stereo Speaker - Connector X19



Connector Type

X19: 2mm Crimp Style Connector with 4 Pos.

Mating Connector: A possible mating connector for X19 is 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 X17. 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 X17) Pinout Description

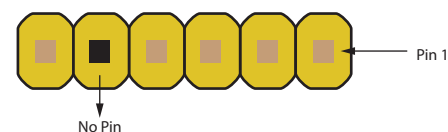
Pin	Signal	Description
1	+3.3V	3.3V supply
2	DMIC_DATA	Serial data from digital MIC
3	GND	Ground
4	SPDIFO2	Secondary S/PDIF output
5	KEY	No pin
6	+5V	5V supply



Connector Type

X17: 2.54mm, 1x6 Pos. Header

Digital MIC/SPDIF - Connector X17



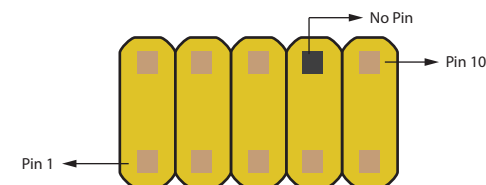
5.3.2.3 Front Panel HD Audio

The front panel HD audio (LINE2 and MIC2) signals of the Realtek ALC888S HDA audio codec are routed to connector X16. The pinout description of the connector is shown below:

Front Panel HD Audio (Connector X27) Pinout Description

Pin	Signal	Description
1	MIC2_L	2nd Analog Stereo Microphone Input - Left Channel
2	GND	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 Input - Right Channel (Headphone)
6	GND_HDA	Audio Ground
7	SENSE_B	Jack Detection Pin 2
8	KEY	No pin
9	LINE2_L	2nd Analog Line Input - Left Channel (Headphone)
10	GND_HDA	Audio Ground

Front Panel Audio - Connector X16





Connector Type

X16: 2.54mm, 2x5 Pin Header

5.4 Communication Bus

The conga-IA3 supports both SMBus and I2C compliant devices.

5.4.1 SMBus

The SMBus signals are available in different locations on the conga-IA3, including the feature connector (X34) described in section 6.13 of this document.

5.4.2 I²C Bus

The congatec Board controller provides I²C signals. These signals are available in different locations on the conga-IA3, including the feature connector (X34) described in section 6.13 of this document.

5.4.3 SPI Bus

The SPI signals are connected to the onboard SPI flash and additionally to the feature connector (X34). The SPI signals on the feature connector provides the ability to boot the conga-IA3 from external flash. This however requires a customized adapter for triggering the BIOS_DISABLE# signal (pin 46) of the feature connector.



Note

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

5.5 Universal Serial Bus (USB)

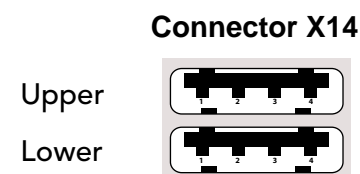
The conga-IA3 provides 8 USB connectors both on the rear side and internally. The rear and internal connectors have 4 USB ports each.

5.5.1 Rear USB Connectors

The conga-IA3 offers a total of four USB ports on the rear side - two USB 2.0 ports on connector X14 and two USB 3.0 ports on connector X15. The USB 2.0 signals on connector X14 are routed directly from the SoC's USB ports 2 and 3. The USB 3.0 signals on connector X15 are routed from the SoC's USB Superspeed and USB port 0 signals via a USB 3.0 hub.

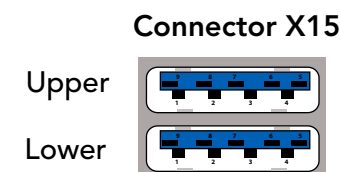
USB 2.0 (Connector X14) Pinout Descriptions

Lower Port			Upper Port		
Pin	Signal	Description	Pin	Signal	Description
A1	+5V	+5V supply	B1	+5V	+5V supply
A2	Data-	Hi-speed differential transceiver (negative)	B2	Data-	Hi-speed differential transceiver (negative)
A3	Data+	Hi-speed differential transceiver (positive)	B3	Data+	Hi-speed differential transceiver (positive)
A4	GND	Ground	B4	GND	Ground



USB 3.0 (Connectors X15) Pinout Descriptions

Lower Port			Upper Port		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	10	+5V	+5V supply
2	Data1-	Hi-speed differential transceiver (negative)	11	Data2-	Hi-speed differential transceiver (negative)
3	Data1+	Hi-speed differential transceiver (positive)	12	Data2+	Hi-speed differential transceiver (positive)
4	GND	Ground	13	GND	Ground
5	SS1_RX-	SuperSpeed receiver differential pair (negative)	14	SS2_RX-	SuperSpeed receiver differential pair (negative)
6	SS1_RX+	SuperSpeed receiver differential pair (positive)	15	SS2_RX+	SuperSpeed receiver differential pair (positive)
7	GND	Ground	16	GND	Ground
8	SS1_TX-	SuperSpeed transmitter differential pair negative)	17	SS2_TX-	SuperSpeed transmitter differential pair (negative)
9	SS1_TX+	SuperSpeed transmitter differential pair (positive)	18	SS2_TX+	SuperSpeed transmitter differential pair (positive)



Connector Type



The +5V signals of connector X14 and X15 have a maximum current of 1.2A each.

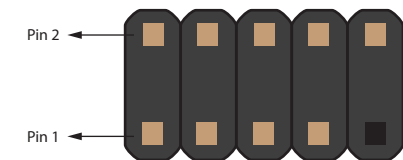
5.5.2 Internal USB Connectors

The conga-IA3 offers 4 USB ports internally - two USB 2.0 ports on connector X12 and two USB 3.0 ports on connector X60. The USB 2.0 signals on connector X12 are routed from the SoC's USB port 1 via a USB 2.0 hub. The USB 3.0 signals on connector X60 are routed from the SoC's USB Superspeed and USB port 0 signals via a USB 3.0 hub.

USB 2.0 Header (Connector X12) Pinout Description

Port 1			Port 2		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	2	+5V	+5V supply
3	Data2-	Hi-speed differential transceiver (negative)	4	Data3-	Hi-speed differential transceiver (negative)
5	Data2+	Hi-speed differential transceiver (positive)	6	Data3+	Hi-speed differential transceiver (positive)
7	GND	Ground	8	GND	Ground
9	No Pin	Empty	10	NC	Not Connected

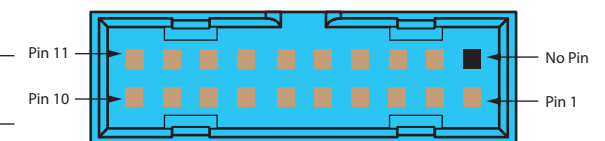
Internal USB 2.0 - Connector X12



USB 3.0 Header (Connectors 60) Pinout Description

Port 1			Port 2		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	11	Data4-	High-speed differential transceiver (-ve)
2	SS3_RX-	SuperSpeed receiver differential pair (-ve)	12	Data4+	High-speed differential transceiver (+ve)
3	SS3_RX+	SuperSpeed receiver differential pair (+ve)	13	GND	Ground
4	GND	Ground	14	SS4_TX+	SuperSpeed transmitter differential pair (+ve)
5	SS3_TX-	SuperSpeed transmitter differential pair (-ve)	15	SS4_TX-	SuperSpeed transmitter differential pair (-ve)
6	SS3_TX+	SuperSpeed transmitter differential pair (+ve)	16	GND	Ground

Internal USB 3.0 - Connector X60



7	GND	Ground	17	SS4_RX+	SuperSpeed receiver differential pair (+ve)
8	Data3+	High-speed differential transceiver (+ve)	18	SS4_RX-	SuperSpeed receiver differential pair (-ve)
9	Data3-	High-speed differential transceiver (-ve)	19	+5V	+5V supply
10	NC	Not Connected	20	No Pin	Empty

Connector Type

X12: 2x5 Pin Header

X60: 2.54mm, 2x10 Pin Header



The +5V signals of connector X12 and X60 have maximum current of 0.5A each.

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.

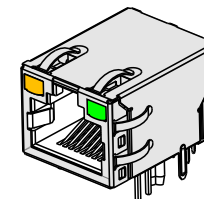
5.6 Ethernet 10/100/1000

The conga-IA3 provides two Gigabit Ethernet ports (connectors X57 and X58) on the rear side. The two Gigabit Ethernet interfaces are supported via the Intel Gigabit Ethernet controller i211. These interfaces do not support the Intel AMT.

Connectors X57/X58 Pinout Description

Pin	Description	10base-T	100Base-T	1000Base-T
1	Transmit Data+ or Bidirectional	TX+	TX+	BI_DA+
2	Transmit Data- or Bidirectional	TX-	TX-	BI_DA-
3	Receive Data+ or Bidirectional	RX+	RX+	BI_DB+
4	Not connected or Bidirectional	nc	nc	BI_DC+
5	Not connected or Bidirectional	nc	nc	BI_DC-
6	Receive Data- or Bidirectional	RX-	RX-	BI_DB-
7	Not connected or Bidirectional	nc	nc	BI_DD+
8	Not connected or Bidirectional	nc	nc	BI_DD-

Gigabit Ethernet - Connector X57/X58



LED Descriptions

LED Left Side	Description
Off	10 Mbps link speed
Green	100 Mbps link speed
Orange	1000 Mbps link speed

LED Right Side	Description
Off	No link
Steady On	Link established, no activity detected
Blinking	Link established, activity detected

Connector Type

X57/X58: 8 Pin RJ45 Connector with Gigabit Magnetic and LEDs.

5.7 SATA Interfaces

5.7.1 Standard SATA Ports

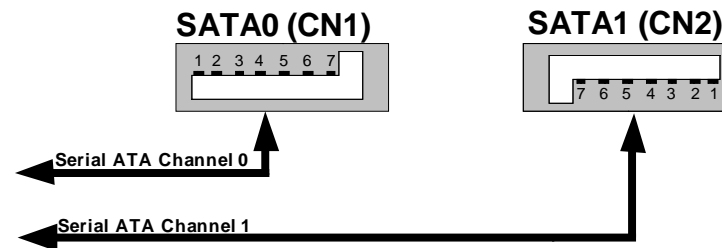
The conga-IA3 provides two SATA ports. The SATA ports are routed to connectors CN1/CN2 and support data rates up to 3GB/s. The SATA LED on the front panel connector (X38) is lit when there is activity on any of the SATA interfaces.

Connectors CN1/CN2 Pinout Description.

Pin	Signal
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

Connector Type

CN1, CN2: Standard SATA Connector



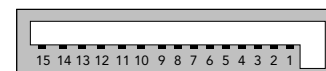
5.7.2 SATA Power

The conga-IA3 provides an internal SATA power for hard drives on connector X8. This connector supplies 3.3V, 5V and 12V.

Connectors X8 Pinout Description.

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

SATA Power (X8)



Connector Type

X8: 15 Pos. SATA Connector.

Note

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

5.7.3 Mini SATA

The mini SATA connector X6 on the conga-IA3 is used to connect mSATA devices. This connector also supports mini PCIe devices. When an mSATA or mPCIe device is connected to X6, the conga-IA3 automatically detects the type of device that is attached.

mSATA (Connector X6) Pin Description.

Pin	Signal	Pin	Signal
1	Reserved	2	+3.3V
3	N.C.	4	GND
5	N.C.	6	+1.5V
7	Reserved	8	N.C.

Pin	Signal	Pin	Signal
9	GND	10	N.C.
11	Reserved	12	N.C.
13	Reserved	14	N.C.
15	GND	16	N.C.
17	Reserved	18	GND
19	N.C.	20	Reserved
21	Card_Present *	22	Reserved
23	+B	24	+3.3V
25	-B	26	GND
27	GND	28	+1.5V
29	GND	30	SMB_CLK
31	-A	32	SMB_DATA
33	+A	34	GND
35	GND	36	Reserved
37	GND	38	Reserved
39	+3.3V	40	GND
41	+3.3V	42	N.C
43	Card_Type_Recognition *	44	N.C
45	N.C	46	N.C
47	N.C	48	+1.5V
49	N.C	50	GND
51	N.C.	52	+3.3Vaux
53	GND	54	GND



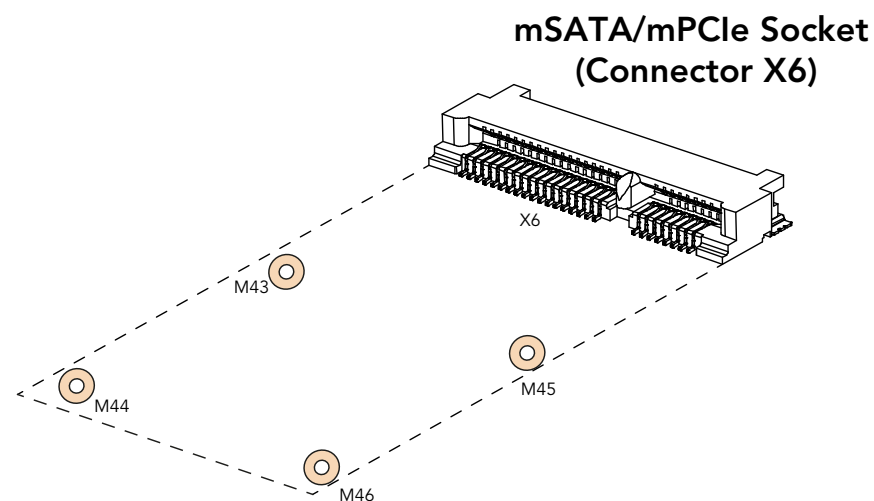
Connector Type

X6: 0.8mm Pitch, 52 Pos. Mini PCI Socket



Note

* For card presence detection, pin 21 of the mSATA card must be terminated to ground. For card type recognition, pin 43 of the mSATA card must be unconnected.



5.8 Display Interfaces

The conga-IA3 supports dual simultaneous displays - one Digital Display Interface and one embedded Display or LVDS interface.

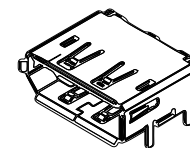
5.8.1 Display Port Interface DP++

The conga-IA3 SBC has one DP++ connector (X26) located at the rear I/O panel. The display port supports the connection of DP, HDMI and DVI displays.

Connectors X26 Pinout Description.

Pin	Signal	Pin	Signal
1	DDI_TX0+	11	GND
2	GND	12	DDI_TX3-
3	DDI_TX0-	13	CONFIG1
4	DDI_TX1+	14	CONFIG2
5	GND	15	DDI_AUX+
6	DDI_TX1-	16	GND
7	DDI_TX2+	17	DDI_AUX-
8	GND	18	DDI_HPD
9	DDI_TX2-	19	GND
10	DDI_TX3+	20	3.3V

DP++ Connector X26



5.8.2 LVDS

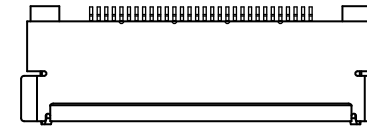
The conga-IA3 offers LVDS interface on connector X32 - a standard 40 pin LVDS connector. The LVDS signals are sourced from the SoC's eDP stream via a multiplexer. Depending on the BIOS setup, the multiplexer routes the eDP stream either directly to the eDP connector X28 or to the LVDS connector X32 via an eDP to LVDS bridge. The multiplexer is configured in the BIOS setup by default to route the eDP signals to the eDP to LVDS bridge. The eDP to LVDS bridge processes and converts the eDP stream to LVDS format.

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 and resolution up to 1920x1200 in dual LVDS mode.

Connector X32 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 X32



Connector Type

X32: 0.5mm, 40 Pos. ACES Connector.

Mating Connector: Possible mating connectors for X32 are ACES 88441-40 and ACES 50204-40.

Note

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.

5.8.3 Embedded Display Port (eDP)

The conga-IA3 provides eDP interface on connector X28 - a standard 40 pin DisplayPort connector. The eDP signals are sourced from the SoC's eDP stream via a multiplexer. Depending on the BIOS setup, the multiplexer routes the eDP stream either directly to the eDP connector X28 on the bottom side of the SBC or to the LVDS connector X32 (top side) via an eDP to LVDS bridge. The multiplexer is by default configured in the BIOS setup to route the eDP signals to the eDP to LVDS bridge.

To route eDP signals to connector X28, change the default BIOS setup.

Connector X28 Pinout Description

Pin	Signal	Pin	Signal
1	N.C.	21	VCC_EDP_FILT
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_DETECT
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_EDP_FILT	38	BKLT_PWR
19	VCC_EDP_FILT	39	BKLT_PWR
20	VCC_EDP_FILT	40	N.C.

eDP Connector X28



Connector Type

X28: 0.5mm , 40 Pos. ACES Connector.

Mating Connector: Possible mating connectors for X28 are ACES 88441-40 and ACES 50204-40.



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.

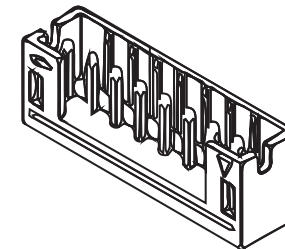
5.8.3.1 Backlight Power Connector

The conga-IA3 provides backlight power on connector X31. The power budget of BKLT_PWR (pins 3 and 4) is limited to 1.5 amps.

Connector X31 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/Brightness Ground
6	GND	Backlight/Brightness Ground
7	Brightness_Up	Flat panel brightness increase
8	Brightness_Down	Flat panel brightness decrease

Backlight Power - Connector X31



Connector Type

X31: 2mm, 8 Pos. Crimp Style Connectors.

Mating Connector: Possible mating connector for X31 is Chyao Shiunn JS-1124-08.



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.

5.8.3.2 Backlight/Panel Power Selection

The conga-IA3 supports different voltages for the panel and backlight. With jumper X29, you can set the panel voltage to 3,3V, 5V or 12V. With jumper X30, you can set the backlight voltage to 5V or 12V.

Connector X29 Pinout Description

Pin	Signal Name
1	No Pin
2	3,3V
3	12V
4	Selected LCD Power
5	No Pin
6	5V

Connector X30 Pinout Description

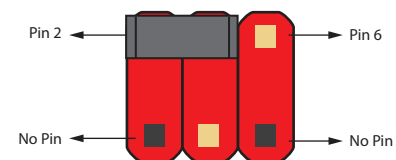
Pin	Signal Name
1	No Pin
2	NC
3	12V
4	Selected Backlight Power
5	No Pin
6	5V



Connector Type

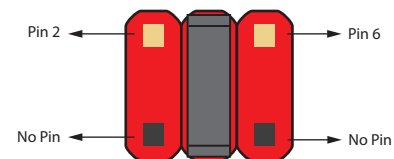
X29, X30: 2.54mm, 2x3 Pos. Connector (without pins 1 and 5)

Panel Voltage Selector - Jumper X29



Default Settings:
Pins 2 and 4

Backlight Voltage Selector - Jumper X30



Default Settings:
Pins 3 and 4

5.8.3.3 Monitor OFF connector

The monitor OFF connector X51 offers the possibility to switch off the displays attached to LVDS or eDP port.

Connector X51 Pinout Description

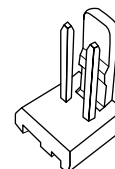
Pin	Function
1	MONITOR_OFF#
2	GND



Connector Type

X51: 2.54mm, 2 Pos. Molex Connector.

Monitor OFF - Connector X51



5.9 PCI Express

The conga-IA3 provides 3 PCIe interfaces - a x1 PCIe slot on connector X9, a half-size mini PCIe (mPCIe) slot on connector X10 and a full size mini PCIe/mini SATA slot on connector X6. Th

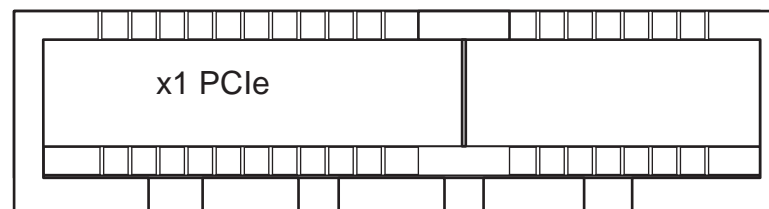
5.9.1 x1 PCIe Slot

The conga-IA3 offers one PCIe x1 slot on connector X9. The SoC's PCIe lane 0 signals are routed to connector X9 (x1 PCIe slot) via a multiplexer and to connector X6 (mini PCIe/mini SATA) via two multiplexers. Connector X9 shares the SoC's PCIe lane 0 with connector X6. The PCIe signals are controlled via the multiplexer. Immediately an mPCIe device is inserted, the multiplexer automatically switches the PCIe lane 0 signals to connector X6.

x1 PCIe Slot (Connector X9) 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.

PCIe Slot (Connector X9)



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



Connector Type

X9: PCIe x1 Connector



Note

The PCIe x1 slot on connector X9 will not function if you insert a mini PCIe card into the mPCIe slot (connector X6). To use the PCIe x1 slot, do not insert any device into the mPCIe slot.

5.9.2 Mini PCIe (Half Size)

The conga-IA3 is equipped with a PCI Express Mini Card socket. PCI Express Mini Card is a unique small size form factor optimized for mobile computing platforms equipped with communication applications. The small footprint connector can be implemented on SBCs, providing the ability to insert different removable PCI Express Mini Cards. Using this approach gives the flexibility to mount an upgradable, standardized PCI Express Mini Card device to the SBC without additional expenditure of a redesign. The table below lists the default pinout of the PCI Express Mini Card.

mPCIe (Connector X10) Pinout Description

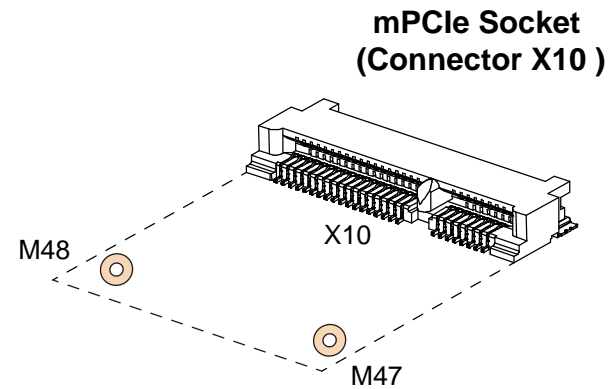
Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3Vaux
3	N.C.	4	GND

Pin	Signal	Pin	Signal
5	N.C.	6	+1.5V
7	CLKREQ#	8	N.C.
9	GND	10	N.C.
11	REFCLK-	12	N.C.
13	REFCLK+	14	N.C.
15	GND	16	N.C.
17	Pull down resistor (1M)	18	GND
19	N.C.	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	+3.3Vaux
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	+3.3Vaux	40	GND
41	+3.3Vaux	42	N.C
43	mSATA_mPCIe_detect	44	N.C
45	CL_CLK	46	N.C
47	CL_DATA	48	+1.5V
49	CL_RST#	50	GND
51	N.C.	52	+3.3Vaux
53	GND	54	GND



Connector Type

X10: PCIe Mini Card Socket

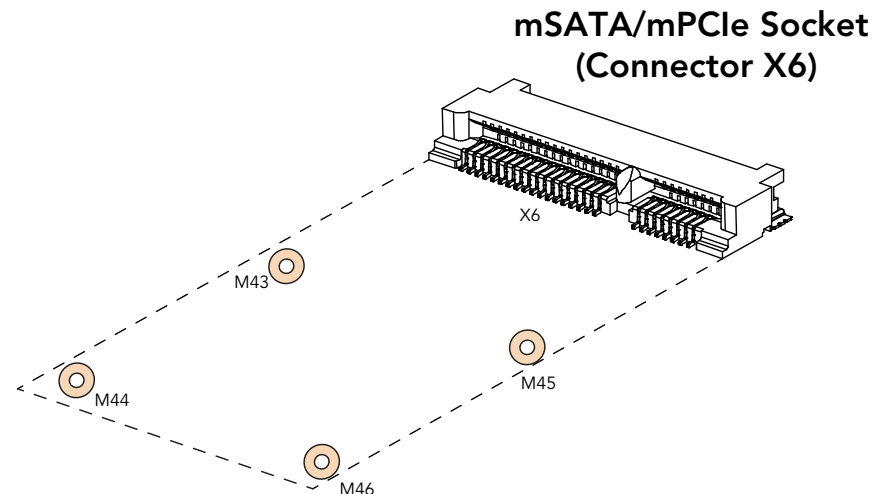


5.9.3 Mini PCIe (Full Size)

The conga-IA3 offers an mPCIe slot on connector X6. This connector supports both mPCIe and mSATA devices. The PCIe signals are routed from the SoC's PCIe lane 0 to connector X6 (mPCIe/mSATA slot) via two multiplexers. The first multiplexer switches the PCIe signals between the x1 PCIe slot (connector X9) and the mPCIe/mSATA slot (connector X6). The second multiplexer switches the SATA signals between SATA port 1 (connector CN2) and mSATA/mPCIe slot.

When an mPCIe or mSATA device is attached to the mPCIe/mSATA slot (connector X6), the SoC detects the connected device via the signal detect pin (pin 43), sets the communication mode to PCIe or SATA and automatically switches the PCIe/SATA signals to mPCIe/mSATA slot.

See section 5.9.2 "Mini PCIe (Half Size)" for the mini PCIe Pinout Description.



Connector Type

X6: PCIe Mini Card Socket

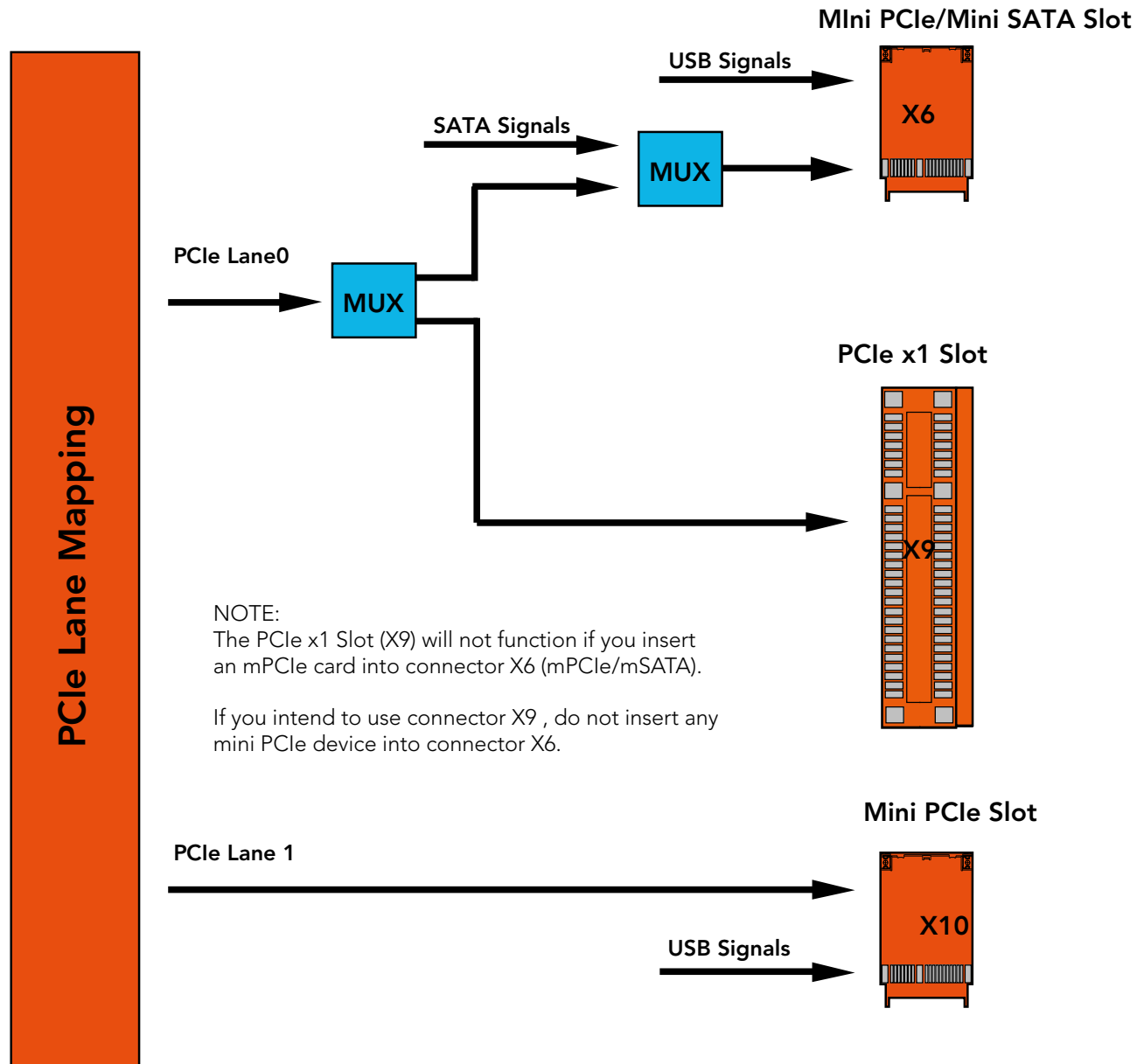
Note

Pins 21 and 43 of the mPCIe card must be terminated to ground for card present detection and card type recognition respectively.

The PCIe x1 slot on connector X9 will not function if you insert a mini PCIe card into the mPCIe slot (connector X6). To make use of the PCIe x1 slot, do not insert any mini PCIe device into the mPCIe slot (connector X6).

5.9.4 PCI Express Routing

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



6 Additional Features

6.1 Front Panel Connector

The conga-IA3 SBC supports front panel features such as power button, status LEDs and reset button via connector X38 - a 10-pin internal header. This connector offers one power supply pin (3.3V). The signals FP_LED+ and FP_LED- communicates the system states to two LEDs connected to this header.

See section 5.1.5 "Power Status LED" for the possible states and corresponding activity of the LEDs.

Front Panel (Connector X38) Pinout Description

Pin	Function	Description
1	HDD_POWER_LED+	Hard disk power LED with pull-up resistor to 3.3V.
2	FP_LED+	Power LED (main color)
3	HDD_LED	Hard disk activity LED
4	FP_LED-	Power LED (alternate color)
5	GND	Ground
6	PWRBTN#	Power Button
7	SYS_RST#	Reset Button
8	GND	Ground
9	3.3V	+3.3V power supply (500mA power budget)
10	KEY	No pin



Connector Type

X38: 10 Pin Header

Front Panel - Connector X38



6.2 Case Open Intrusion Connector

The conga-IA3 provides connector X56 for case-open intrusion detection.

Case Open Intrusion (Connector X56) Pinout Description

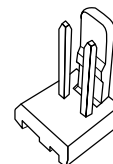
Pin	Function
1	GND
2	CASEOPEN#



Connector Type

X56: 2.54mm, 2 Pos Molex Connector.

Case Open Intrusion - Connector X56



6.3 Trusted Platform Module – TPM (Optional)

The conga-IA3 SBC can optionally be equipped with a TPM 1.2 compliant security chip. The TPM security chip is connected to the LPC bus provided by the integrated Intel Chipset. The basic TPM chip initialization is performed by the SBC's UEFI Boot firmware.

6.4 congatec Board Controller (cBC)

The conga-IA3 is equipped with a Texas Instruments Tiva™ TM4E1231H6ZRBI 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.

6.4.1 Fan Control

The conga-IA3 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.

6.4.2 GPIs

The GPI signals are routed to the feature connector (X38) described in section 6.13.

6.4.3 Power Loss Control

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

6.4.4 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.

6.5 LPC Super I/O Device

The conga-IA3 has an onboard Super I/O controller that provides additional interfaces such as two serial interfaces, optional ccTALK, GPOs, 4-wire CPU and system fans. The Winbond W83627DHG Super I/O controller is connected to the LPC Bus of the Intel® SoC.

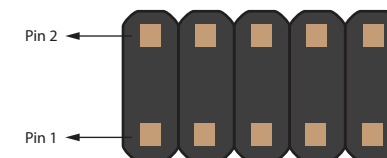
6.5.1 Serial Ports (COM)

The Super IO controller on the conga-IA3 provides two fully featured RS-232 compliant UART interfaces (COM 0 and 1). The COM 1 interface can be optionally used as ccTALK compliant interface. The COM ports can drive up to 115 kbit/s at a maximum cable length of 15 m.

Serial Ports (Connectors X21/X23) Pinout Description

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

COM 0 & 1 - Connectors X21/X23



Connector Type

X21,X23: 2x5 Pin Headers



congatec offers the adapter cable for the COM ports (see section 1.2.2 "Optional Accessories/Cables). For more information, contact congatec technical solution department.

6.5.2 GPOs

The GPO signals are routed to the feature connector (X38) described in section 6.13.

6.5.3 CPU/System Fan Connector & Power Configuration

The conga-IA3 supports the connection of 5V or 12V cooling fans. The signals of the CPU and system fans are routed to 4-pin connectors X35 and X37 respectively. Use jumper X33 to select the CPU fan voltage and jumper X36 to select the system fan voltage.

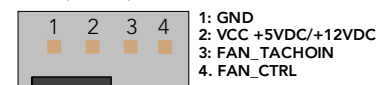
The following tables describe the pinouts and jumper configuration.

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

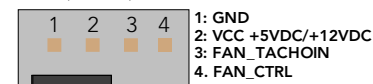
X36 System FAN Pin	Signal
1	GND
2	VCC +5VDC/+12VDC
3	FAN_TACHOIN
4	FAN_CTRL

Jumper X32, X36	Configuration
1 - 2	FAN +12VDC (default)
2 - 3	FAN +5VDC

**CPU Fan
(X35)**



**SYS Fan
(X37)**



**X33
X36**



Connector Type

X35, X37: 4 pin 2.54mm Grid Female Fan Connector.

X33, X36: 2.54mm Grid Jumper.



Note

The maximum power of the CPU fan is approximately 3W while the system fan has a maximum power of approx. 4.5W.

6.6 OEM BIOS Customization

The conga-IA3 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, which is called CGUTLm1x.pdf and can be found 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 AN8_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/add the OEM POST logo.

6.6.4 OEM BIOS Code/Data

With the congatec embedded BIOS, it is possible for system designers to add their own 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 Win XP SLP installation, Window 7 SLIC table (OA2.0), Windows 8 OEM activation (OA3.0), verb tables for HDA codecs, PCI/PCIe opROMs, bootloaders, rare graphic modes and Super I/O controller initialization.



The OEM BIOS code of the new UEFI based firmware is only called 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

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

In addition to the ACPI-Compliant Control Method Battery mentioned above, the latest versions of the conga-IA3 BIOS and board controller firmware also support LTC1760 battery manager from Linear Technology and a battery only solution (no charger). All three battery solutions are supported on the I2C bus and the SMBus. This gives the system designer more flexibility when choosing the appropriate battery sub-system.

For more information about this subject visit the congatec website and view the following documents:

- congatec Battery Management Interface Specification
- Battery System Design Guide
- conga-SBM³ User's Guide

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, which is available on the congatec website .

6.9 GPIOs

The conga-IA3 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 X34.

6.10 Thermal/Voltage Monitoring

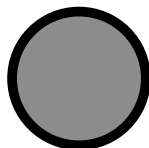
The conga-IA3 SBC features three temperature sensors - the CPU, memory and board controller sensors.

The board controller can monitor six different voltages which are main power, 5V (runtime), 5V (standby), 1.05V (runtime), VCORE, 3,3V (runtime) and 3,3V (standby).

6.11 Beeper

The board-mounted speaker (M10) provides audible error code (beep code) information during POST.

**PC Beeper
(M10)**



6.12 External System Wake Event

The conga-IA3 supports LAN, USB, PCIe and PWRBTN driven wake up events.

6.13 Feature Connector

The conga-IA3 provides an internal 50 pol. 2mm pin header as feature connector. The pinout is described below:

Feature Connector X34 Pinout Description

Pin	Signal	Pin	Signal
1	+V5S	2	GND
3	LAD0	4	LAD1
5	LAD2	6	LAD3
7	LFRAME#	8	SERIRQ#
9	LPC_CLK (25MHz)	10	BUF_PLT_RST#
11	SMB_DATA	12	SMB_CLK
13	SMB_ALERT#	14	GND
15	TX_CGBC	16	RX_CGBC
17	GPO0	18	GPO1
19	GPO2	20	GPO3
21	GPO4	22	GPO5
23	GPO6	24	GPO7
25	GPI0	26	GPI1
27	GPI2	28	GPI3
29	GPI4	30	GPI5
31	GPI6	32	GPI7
33	PM_SLP_S3#	34	PM_SLP_S5#
35	PM_SLP_S4#	36	LID_BTN#
37	SLP_BTN#	38	PM_THRM#
39	WDOUT	40	WDTRIG
41	I2C_DAT	42	PWR_OK
43	SPI_CS#	44	I2C_CLK
45	SPI_SO	46	BIOS_DISABLE#
47	SPI_CLK	48	SPI_SI
49	+V5A	50	GND

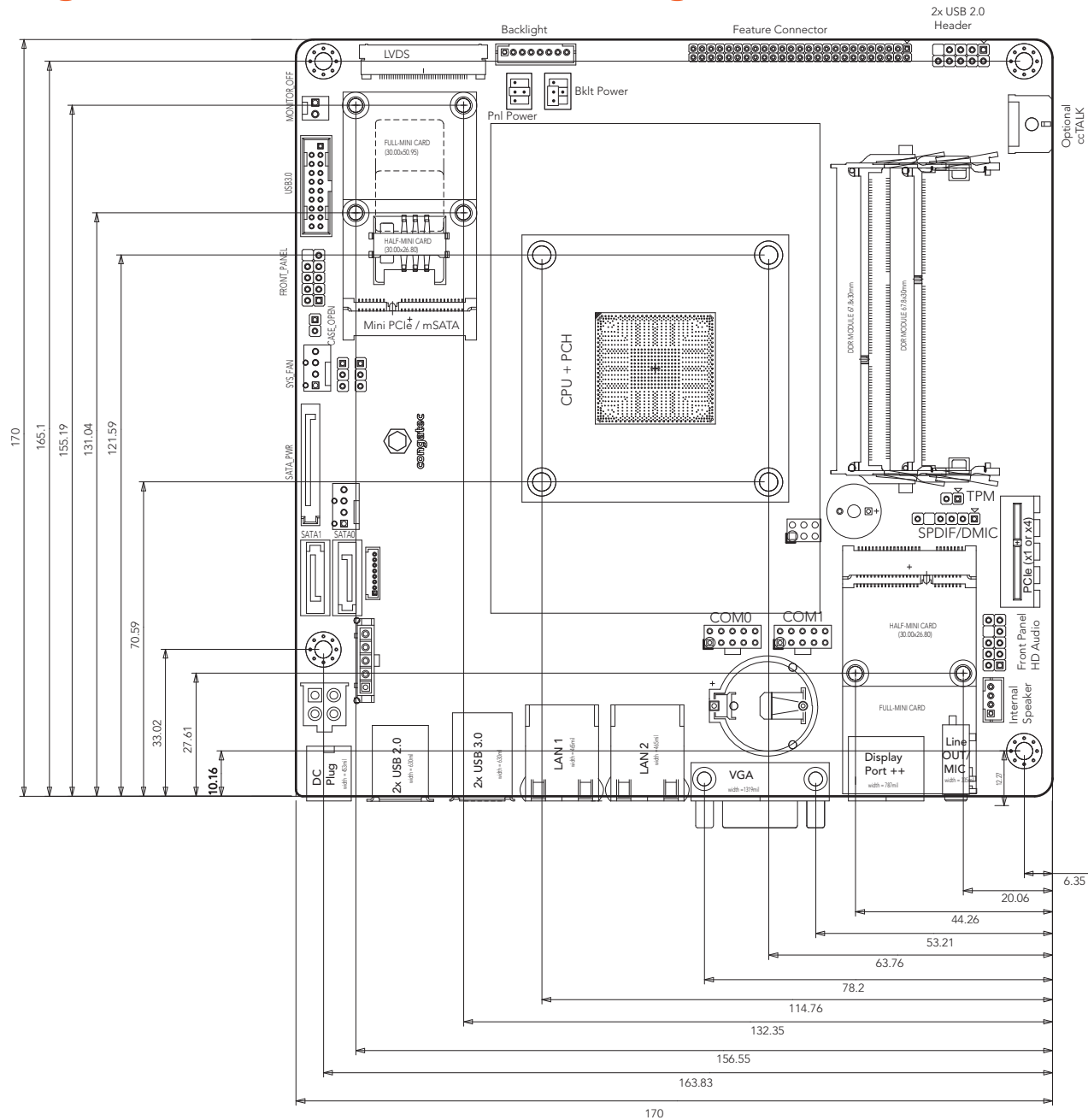
Feature Connector X34



Connector Type

X34: 2mm, 2 x 25 Pos Header.

7 conga-IA3 Mechanical Drawing



8 conga-IA3 BIOS Setup Description

TBD

9 Additional BIOS Features

TBD

10 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
Intel® Thin Mini-ITX Design Guide (thin-mini-itx-based-pc-system-design-guide-rev-1-2.pdf)	http://www.intel.com
PCI Express Base Specification, Revision 2.0	http://www.pcisig.com/specifications