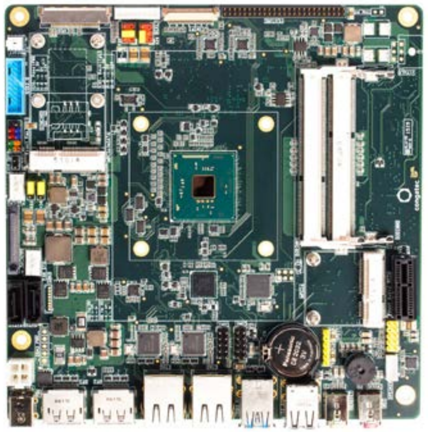

conga-IA4 Thin Mini-ITX SBC

Detailed Description Of The congatec Thin Mini-ITX Based On 4th Generation Intel Celeron/Pentium SoCs

User's Guide

Revision 1.2

Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
0.1	2016.06.24	AEM	• Preliminary release
1.0	2016.07.18	AEM	• Updated section 1.22 "Optional Accessories" • Added sections 2.4 "Supply Voltage Power", 2.5 "Power Consumption" and 2.6 "Supply Voltage Battery Power" • Corrected the torque specification in section 4.2 "CSP Dimensions" • Added section 8 "BIOS description" and section 9 "Additional BIOS features" • Official release
1.1	2016.10.11	AEM	• Deleted references to MIPI and eDP because these interfaces are no longer supported.
1.2	2018.12.21	AEM	• Updated the information about handling electrostatic sensitive devices in preface section • Added power consumption values for PN:052609 in table 4 "Power Consumption Values" • Updated sections 2.5 "Power Consumption" and 2.6 "Supply Voltage Battery Power" • Updated the block diagram • Updated section 8 "BIOS Setup Description" • Added sub-sections to section 9 "Additional BIOS Features" and updated section 9.4 "Supported Flash Devices"

Preface

This user's guide provides information about the components, features and connectors available on the conga-IA4 Thin Mini-ITX Single Board Computer.

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

Caution

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

Contents

List of Tables

1 Introduction

1.1 Mini-ITX Concept

The Mini-ITX form factor provides engineers 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-IA4

The conga-IA4 is a Single Board Computer designed based on the Thin Mini-ITX specification. The conga-IA4 SBC features the Intel 4th generation Celeron/Pentium processors. With maximum 6W 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 1600 MT/s for a maximum system memory capacity of 16 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-IA4 SBC provides manufacturers and enthusiasts with the opportunity to design compact systems for space restricted areas. With appropriate I/O shield, the same conga-IA4 SBC can be used in either a Thin Mini-ITX or a Mini-ITX design.

The various features and capabilities offered by the conga-IA4 makes it ideal for the design of compact, energy efficient, performance-oriented embedded systems.

1.2.1 Options Information

The conga-IA4 is currently available in five 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

Table 1 conga-IA4 Variants

Part-No.	052605	052606	052607	052608	052608
Processor	Intel® Celeron® N3010 1.04 GHz Dual Core™	Intel® Celeron® N3060 1.60 GHz Dual Core™	Intel® Celeron® N3160 1.60 GHz Quad Core™	Intel® Pentium® N3710 1.60 GHz Quad Core™	Intel® Atom® x5-E8000 1.04 GHz Quad Core™
Burst Frequency	2.24 GHz	2.48 GHz	2.24 GHz	2.56 GHz	2.00 GHz
L2 Cache	2 MB	2 MB	2 MB	2 MB	2 MB
Memory (DDR3L)	1600 MT/s dual channel	1600 MT/s dual channel	1600 MT/s dual channel	1600 MT/s dual channel	1600 MT/s dual channel
Processor Graphics	Intel® HD Graphics 400	Intel® HD Graphics 400	Intel® HD Graphics 400	Intel® HD Graphics 405	Intel® HD Graphic
Graphics Base/Burst Freq.	320 / 600 MHz	320 / 600 MHz	320 / 600 MHz	400 / 700 MHz	320 MHz
VGA	No	No	No	No	No
LVDS	Single/dual 18/24 bit	Single/dual 18/24 bit	Single/dual 18/24 bit	Single/dual 18/24 bit	Single/dual 18/24 bit
DDI	DP / HDMI / DVI	DP / HDMI / DVI	DP / HDMI / DVI	DP / HDMI / DVI	DP / HDMI / DVI
Processor TDP (SDP)	4 W (3 W)	6 W (4 W)	6 W (4 W)	6 W (4 W)	5 W

1.2.2 Optional Accessories

Table 2 Cooling/IO Shield

Article	Part No.	Description
conga-IA40/CSP	052351	Passive cooling solution with Thin Mini-ITX height
conga-IA40/Retention Frame	052355	Retention frame for conga-IA4 standard cooling
conga-IA4 IO Shield Standard Size	052651	IO shield for conga-IA4 with standard Mini-ITX chassis (40 mm height)
conga-IA4 IO Shield Thin Size	052651	IO shield for conga-IA4 with Thin Mini-ITX chassis (25 mm height)

Table 3 Memory Modules

Article	Part No.	Description
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)

Table 4 Cables

Article	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 DP to 19 pin female HDMI
cab-ThinMini-ITX-SATA-Power (50cm lenght)	14000135	50 cm SATA power cable with 2x15 pin female connectors.
cab-ThinMini-ITX-SATA-Power (30cm length)	14000136	30 cm SATA power cable with 2x15 pin female connectors.
SATA III cable (straight/straight)	48000029	30 cm SATA III data cable with straight/straight connectors
SATA III cable (straight/right-angled)	48000030	30 cm SATA III data cable with straight/right-angled connectors

Table 5 Adapters

Article	Part No.	Description
conga-Thin MITX/LVDS Adapter	052233	LVDS pin header evaluation adapter for congatec Thin Mini-ITX boards
conga-Thin MITX/Debug Card	047858	Evaluation debug card with post code display, buttons, status LED's; also for external BIOS update and other useful IO's

2 Specification

2.1 Feature List

Table 6 Feature Summary

Form Factor	Based on Thin Mini-ITX form factor (170 x 170 mm)	
Processor	Intel® Pentium® N3710 Intel® Celeron® N3160, N3060, N3010	
Memory	Two memory sockets (located on the top side of the conga-IA4). Supports: - SO-DIMM non-ECC DDR3L modules - Data rates up to 1600 MT/s - Maximum 8 GB capacity	
cBC	Multi-stage watchdog, manufacturing and board information, board statistics, I2C bus, Power loss control	
Chipset	Integrated in the SoC	
Audio	Realthek ALC888s 7.1 channel High Definition Audio codec	
Ethernet	2x Gigabit Ethernet support via the onboard Intel® I211 Phy	
Graphics	Intel® HD Graphics Gen. 8 LP with support for DirectX11.1, OpenGL 4.2, OpenCL 1.2, OpenGLES 3.0, full HW acceleration with H.265/HEVC decoding and H.264 encoding, MPEG2, MVC, VC-1, WMV9, JPEG and three independent displays	
Graphic Interfaces	2x DisplayPort++ (DP, HDMI/DVI) and 1x LVDS	
Back Panel I/O Connectors	1x DC-IN 2x DisplayPort ++ (DP++). Supports DP/DVI/HDMI 2x Gigabit Ethernet	2x USB 2.0 2x USB 3.0/2.0 1x Line OUT 1x Mic IN
Onboard I/O Connectors	1x LVDS (top side) 1x Backlight 1x Monitor OFF SATA Interfaces - 2x Standard SATA III (6.0 Gb/s). - 1x mini SATA (shared with mini PCIe slot) - 1x SATA power header connector (3.3V, 5V or 12V) PCI Express Interfaces - 1x PCIe 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 2x USB 3.0/2.0 Header 1x MicroSD slot (located at the bottom side)	1x Front panel HD audio 1x SPDIF/Digital microphone 1x Internal stereo speaker Connectors supported via Super IO - 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 Internal power header (12-24V) Optional Interfaces (not populated by default): - SBM^3 signal support - SBM^3 power support - ccTALK
BIOS	AMI Aptio® UEFI 5.x firmware, 8/16 MByte serial SPI with congatec Embedded BIOS features	

Power Management	ACPI 4.0 compliant with battery support. Also supports Suspend to RAM (S3) Configurable TDP Ultra low standby power consumption, Deep Sx
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)
Security	Optional discrete Trusted Platform Module "TPM 1.2/2.0", new AES Instructions for faster and better encryption

Note

The conga-IA4 supports only DDR3L memory modules. The memory modules in the sockets must be symmetrical - that is, same raw cards and same memory sizes. Therefore, do not use different memory modules in the memory sockets. Doing so may cause system instability or memory errors. Also make sure the memory modules support the data transfer rate of the particular variant.

In addition, when using one memory socket, insert the memory module only in the first memory slot on the conga-IA4 (top side). If the first memory slot is empty, the SoC on the conga-IA4 ignores the second memory socket (bottom side). When this happens, the conga-IA4 does not start. See the Intel's Braswell datasheet for more information.

2.2 Supported Operating Systems

The conga-IA4 supports the following operating systems.

- Microsoft® Windows® 10
- Microsoft® Windows® 8.1
- Microsoft® Windows® 7
- Microsoft® Windows® 7/8 Embedded Standard
- Linux

Note

To install Windows 7/8 and WES7/8, we recommend a minimum storage capacity of 16 GB. congatec will not offer support for systems with less than 16 GB storage space.

2.3 Mechanical Dimensions

- 170 mm x 170 mm
- Maximum Height: 20 mm

2.4 Supply Voltage Power

- 12V - 24V DC ± 10%

2.5 Power Consumption

The power consumption values were measured with the following setup:

- conga-IA4 COM
- modified congatec carrier board
- conga-IA4 cooling solution
- 12 V input voltage for S0 states and 5 V for S3 and S5 states
- Microsoft Windows 7 (64-bit)

Note

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

Table 7 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	The CPU was stressed to its maximum frequency
S0: Maximum value	Highest frequency mode (HFM/Turbo Boost)	The CPU was stressed to its maximum frequency
S0: Peak value	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 that sufficient power is supplied during worst case scenarios
S3	COM is powered by VCC_5V_SBY	
S5	COM is powered by VCC_5V_SBY	

Note

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

Table 8 Power Consumption Values

The tables below provide additional information about the power consumption data for each of the conga-IA4 variants offered. The values are recorded at various operating mode.

Part No.	Memory Size	H.W Rev.	BIOS Rev.	OS (64-bit)	CPU			Current (A)				
					Variant	Cores	Freq/Turbo (GHz)	S0: Min	S0: Max	S0: Peak	S3	S5
052605	2 x 2 GB	A.2	IA40R110	Windows 7	Intel® Celeron® N3010	2	1.04 / 2.24	0.48	1.18	1.37	0.19	0.14
052606	2 x 2 GB	A.2	IA40R110	Windows 7	Intel® Celeron® N3060	2	1.60 / 2.48	0.50	1.34	1.39	0.20	0.15
052607	2 x 2 GB	A.2	IA40R110	Windows 7	Intel® Celeron® N3160	4	1.60 / 2.24	0.51	1.43	1.83	0.20	0.14
052608	2 x 2 GB	A.2	IA40R110	Windows 7	Intel® Pentium® N3710	4	1.60 / 2.56	0.43	1.58	2.32	0.20	0.14
052609	2 x 2 GB	A.2	IA40R110	Windows 7	Intel® Atom™ x5-E8000	4	1.04 / 2.00	0.55	1.16	1.22	0.22	0.15

Note

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

2.6 Supply Voltage Battery Power

Table 9 CMOS Battery Power Consumption

RTC @	Voltage	Current
-10°C	3V DC	3.35 µA
20°C	3V DC	4.10 µA
70°C	3V DC	18.74 µA

Note

1. *Do not use the CMOS battery power consumption value listed above to calculate CMOS battery lifetime.*

2. *Measure the CMOS battery power consumption of your application in worst case conditions (for example, during high temperature and high battery voltage).*

3. *Consider the self-discharge of the battery when calculating the lifetime of the CMOS battery. For more information, refer to application note AN9_RTC_Battery_Lifetime.pdf on congatec AG website at www.congatec.com/support/application-notes.*

4. *We recommend to always have a CMOS battery present when operating the conga-IA4.*

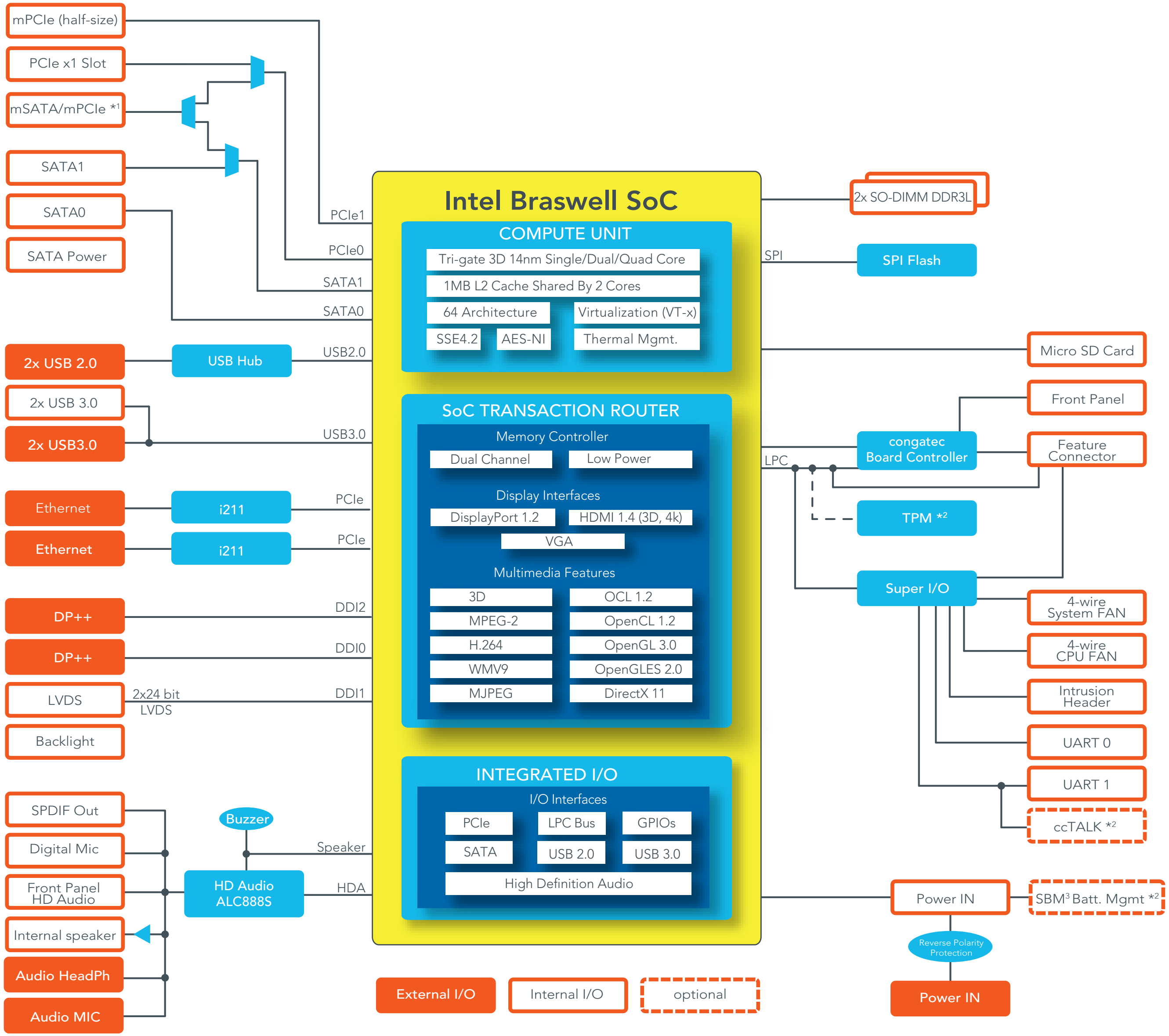
2.7 Environmental Specifications

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 Optional feature.

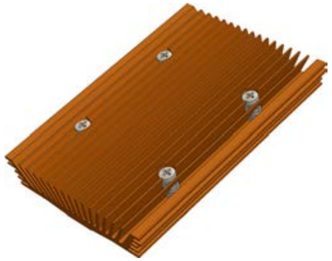
4 Cooling Solution

The conga-IA4 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-IA4 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-IA4 is maintained.

congatec AG offers two cooling possibilities for the conga-IA4:

- A congatec passive cooling solution (CSP) in combination with the conga-IA4 retention frame. The CSP complies with 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-IA4 retention frame.



Passive Cooling Solution

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" 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's mounting holes.
- Remove the CSP's protection pull tab foil from the phase changer and carefully place the CSP to the CPU.
- Insert assembling screws.
- Hold the CSP 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 CSP 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

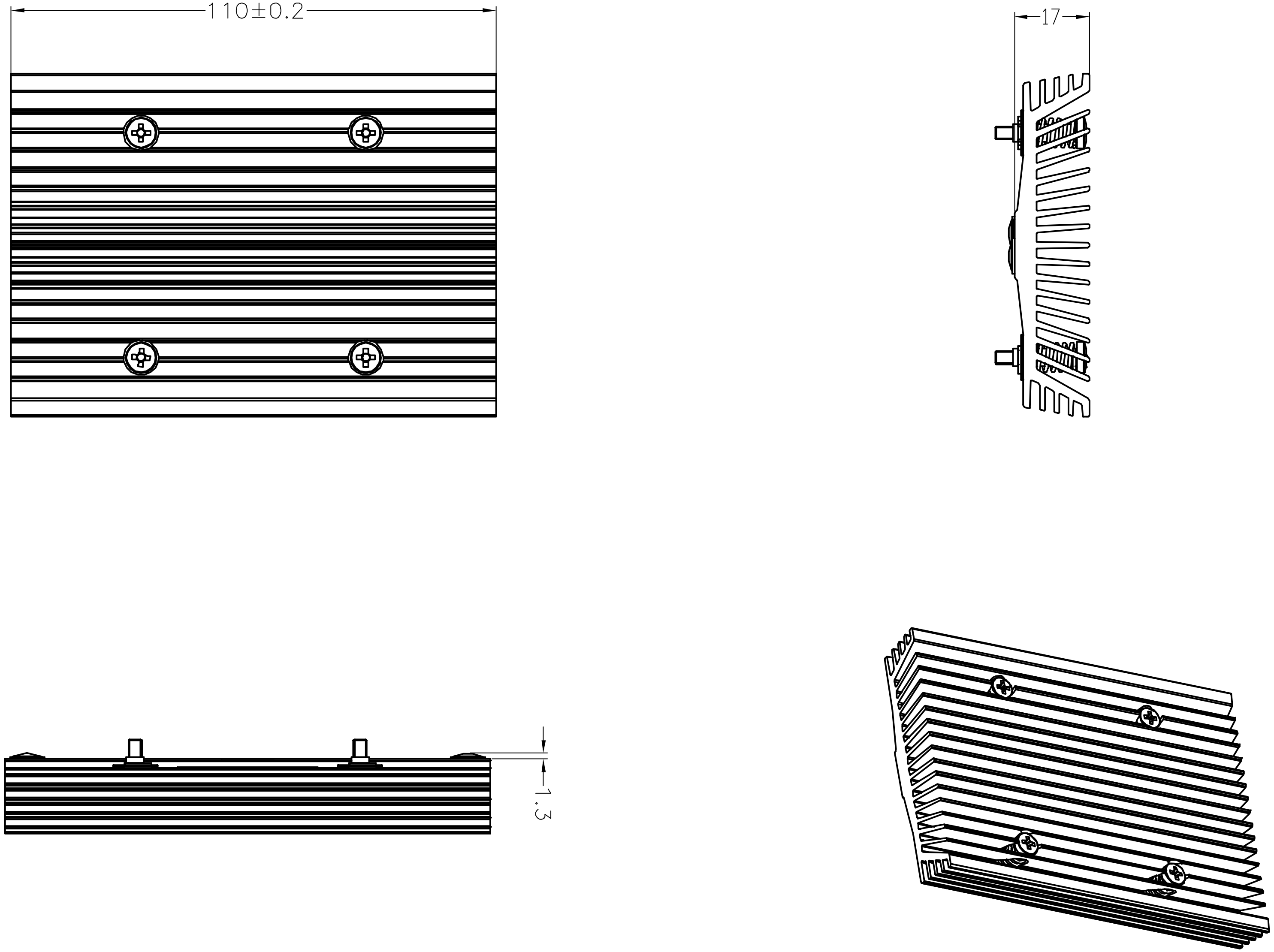
The congatec cooling solutions are designed for commercial temperature range only (0° to 60°C). Therefore, do not use the congatec CSP in temperatures above 60°C or below 0°C. If an end user's system operates above 60°C or below 0°C, or is assembled with a non-congatec cooling solution, then the end user must use or design an optimized thermal solution that meets the needs of their application.

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

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

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

4.2 CSP Dimensions



Note

All measurements are in millimeters. Torque specification for cooling solution screws is 0.3 Nm. Mechanical system assembly mounting shall follow the valid DIN/IS0 specifications.

5 Connector Description

5.1 Power Supply

You can power the conga-IA4 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 SBM^3 power connector (only BOM option). When this connector (X50) is populated, you can power the SBC with it.

Note

The supplied voltages must be within a tolerance of ± 10%

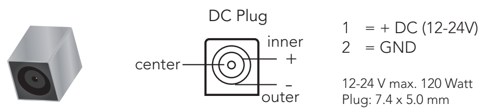
5.1.1 DC Power Jack (Rear I/O)

The conga-IA4 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.

Table 10 Connector X43 Pinout Description

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

DC Power Jack - Connector X43



Connector Type

X43 : DC power jack, 7.4x5.1mm diameter

Note

The conga-IA4 starts immediately power is supplied.

Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA4 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

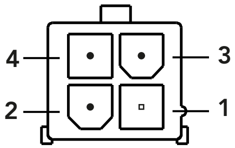
5.1.2 Power Supply (Internal Connector)

The conga-IA4 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.

Table 11 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 : Internal power connector with 4 pin, 4.2mm pitch (PN: 41500079)

Possible Mating Connector: Molex 39-01-2045

Note

The conga-IA4 starts immediately power is supplied.

Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA4 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

5.1.3 Optional SBM^3 Power Connector (Internal Connector)

The conga-IA4 offers an optional SBM^3 power connector (only BOM option). When this connector (X50) is populated, you can power the conga-IA4 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.

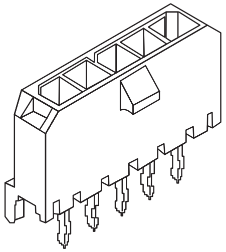
Note

To use the SBM^3 feature, you must update the conga-IA4 firmware.

Table 12 Connector X50 Pinout Description

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

SBM3 Power - Connector X50



Connector Type

X50 : Micro-Fit connector with 1x5 pin, 3mm pitch

Caution

The absolute maximum rating of the input voltage is 36 volts. Do not exceed this rating or expose the conga-IA4 to the absolute maximum voltage for a prolonged time. Doing so may damage the system or affect system reliability.

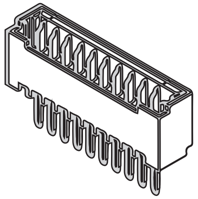
5.1.3.1 Optional SBM3 Signal Connector

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-IA4 and the battery kit.

Table 13 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#

SBM3 Signal - Connector X45



Connector Type

X45 : 1x8 pin, 1.25mm pitch PicoBlade

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-IA4 provides two LED signals (FP_LED+ and P_LED-) on pins 2 and 4 of the front panel connector X38. The signals indicate the different power states of the conga-IA4. Possible states and corresponding activity of the LEDs are shown below:

Table 14 Double-Color Power LED

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

Table 15 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-IA4 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-IA4 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 rear audio connectors are Line-OUT and Mic-IN.

5.3.1 Rear Audio Connectors

The conga-IA4 has a high definition audio codec (Realtek ALC888S) mounted on it.

The line output signals and the microphone signals are respectively routed to connectors X62 (line-OUT) and X61 (Mic-IN) on the rear side. The drivers for this codec can be found on the congatec website at http://www.congatec.com/en/products/mini-itx/conga-ia4.html, under the software section.

Table 16 MIC-IN (X61) Pinout Description

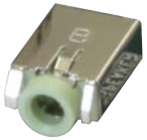
Pin	Signal	Description
1	MIC1_L	1st Stereo microphone analog input left channel
2	A_GND	Analog ground
3	MIC1_R	1st Stereo microphone analog input right channel
4	A_GND	Analog ground
5	SENSE_A	Jack detect pin 1
6	A_GND	Analog ground

MIC IN - Connector X61

Table 17 Line-OUT (X62) Pinout Description

Pin	Signal	Description
1	FRONT_L	Front analog output left channel
2	A_GND	Analog ground
3	FRONT_R	Front analog output right channel
4	A_GND	Analog ground
5	SENSE_A	Jack detect pin 1
6	A_GND	Analog ground

Line OUT - Connector X62



Connector Type

X61: 6 pin, single audio jack - lime color

X62: 6 pin, single audio jack - pink color

5.3.2 Internal Audio Connectors

The conga-IA4 provides the stereo speaker, digital microphone/SPDIF and front panel HD audio connectors internally.

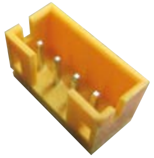
5.3.2.1 Stereo Speaker Header

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 at 5V.

Table 18 Stereo Speaker (X19) Pinout Description

Pin	Signal	Description
1	OUTL-	Left channel negative differential output
2	OUTL+	Left channel positive differential output
3	OUTR+	Right channel positive differential output
4	OUTR-	Right channel negative differential output

Stereo Speaker - Connector X19



Connector Type

X19: 2mm crimp style connector with 4 pins.

Possible Mating Connector: Chyao Shiunn JS-1124-04.

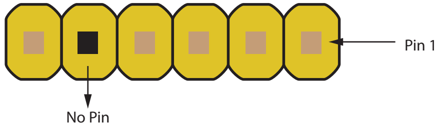
5.3.2.2 Digital Microphone/SPDIF

The digital microphone/SPDIF signals of the Realtek ALC888S HDA audio codec are routed to connector X17 (internal digital microphone/ SPDIF). This connector offers two power supply pins - 3,3V and 5V. Power Budget of these pins is limited to 500mA.

Table 19 Internal Digital Microphone/SPDIF (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

Digital MIC/SPDIF - Connector X17



Connector Type

X17: 2.54mm, 1x6 pin header

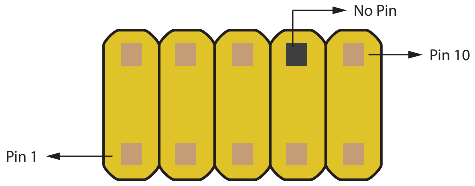
5.3.2.3 Front Panel HD Audio

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:

Table 20 Front Panel HD Audio (Connector X16) 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	MIC2_JD	Microphone input jack detect
7	SENSE_B	Jack detection pin 2
8	KEY	No pin
9	LINE2_L	2nd Analog line input - left channel (headphone)
10	LINE2_JD	Line input jack detect

Front Panel Audio - Connector X16



Connector Type

X16: 2.54mm, 2x5 pin header

5.4 Communication Bus

The conga-IA4 supports both SMBus and I2C compliant devices.

5.4.1 SMBus

The SMBus signals are available in different locations on the conga-IA4, 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-IA4, 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 also to the feature connector (X34). The SPI signals on the feature connector provides the ability to boot the conga-IA4 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 for internal use only.

5.5 LPC Super I/O Device

The conga-IA4 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 Super I/O controller is connected to the SoC's LPC Bus.

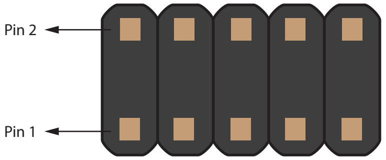
5.5.1 Serial Ports (COM)

The Super I/O controller on the conga-IA4 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.

Table 21 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: 2.54mm pitch, 2x5 pin headers

Note

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

5.5.2 CPU/System Fan Connector & Power Configuration

The conga-IA4 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

Table 22 CPU Fan (X35)

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

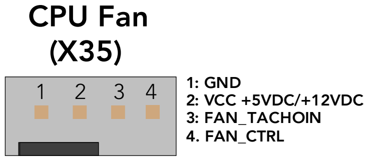


Table 23 System Fan (X37)

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

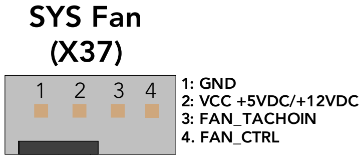
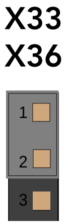


Table 24 Jumper X33, X36

Pin	Configuration
1 - 2	FAN +12VDC (default)
2 - 3	FAN +5VDC



Connector Type

X35, X37: 4 pin 2.54mm grid female fan connector.

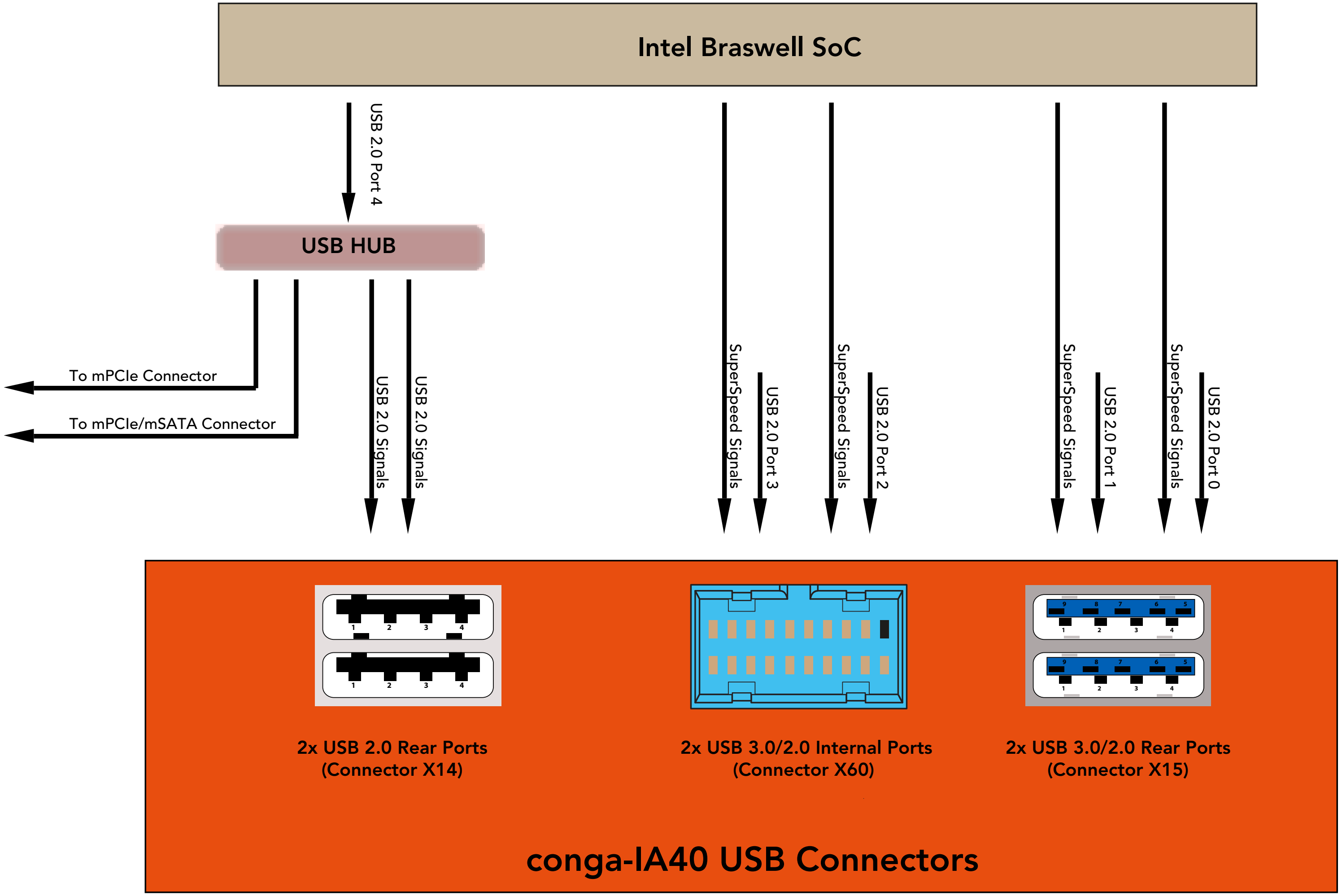
X33, X36: 2.54mm grid jumper.

Note

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

5.6 Universal Serial Bus (USB)

The conga-IA4 provides 6 USB ports - 4 USB ports on the rear side and 2 USB ports internally. The USB routing diagram is shown below:



5.6.1 Rear USB Connectors

The conga-IA4 offers 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 pinouts are described below:

Table 25 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

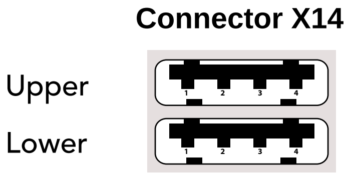
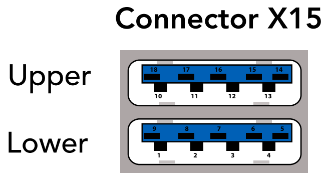


Table 26 USB 3.0 (Connectors X15) Pinout Descriptions

Lower Port			Upper Port		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	10	+5V	+5V supply
2	Data0-	Hi-speed differential transceiver (negative)	11	Data1-	Hi-speed differential transceiver (negative)
3	Data0+	Hi-speed differential transceiver (positive)	12	Data1+	Hi-speed differential transceiver (positive)
4	GND	Ground	13	GND	Ground
5	SS0_RX-	SuperSpeed receiver differential pair (negative)	14	SS1_RX-	SuperSpeed receiver differential pair (negative)
6	SS0_RX+	SuperSpeed receiver differential pair (positive)	15	SS1_RX+	SuperSpeed receiver differential pair (positive)
7	GND	Ground	16	GND	Ground
8	SS0_TX-	SuperSpeed transmitter differential pair negative)	17	SS1_TX-	SuperSpeed transmitter differential pair (negative)
9	SS0_TX+	SuperSpeed transmitter differential pair (positive)	18	SS1_TX+	SuperSpeed transmitter differential pair (positive)



Connector Type

X14,X15: Two type A, dual port USB connectors

Note

Connectors X14 and X15 have maximum current of 0.5A and 1.2A respectively.

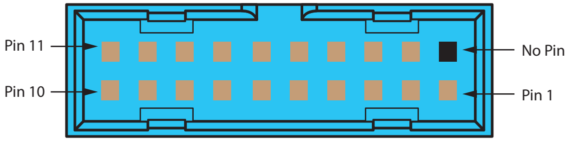
5.6.2 Internal USB Connector

The conga-IA4 offers two USB 3.0 ports on connector X60 (internal header). The ports are backward compatible to USB 2.0 devices.

Table 27 USB 3.0 Header (Connectors 60) Pinout Description

Port 3			Port 2		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V supply	11	Data2+	High-speed differential transceiver (+ve)
2	SS3_RX-	SuperSpeed receiver differential pair (-ve)	12	Data2-	High-speed differential transceiver (-ve)
3	SS3_RX+	SuperSpeed receiver differential pair (+ve)	13	GND	Ground
4	GND	Ground	14	SS2_TX+	SuperSpeed transmitter differential pair (+ve)
5	SS3_TX-	SuperSpeed transmitter differential pair (-ve)	15	SS2_TX-	SuperSpeed transmitter differential pair (-ve)
6	SS3_TX+	SuperSpeed transmitter differential pair (+ve)	16	GND	Ground
7	GND	Ground	17	SS2_RX+	SuperSpeed receiver differential pair (+ve)
8	Data3-	High-speed differential transceiver (-ve)	18	SS2_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

Internal USB 3.0 - Connector X60



Connector Type

X60: 2.54mm, 2x10 pin header

Note

Connector X60 has a maximum current of 1.2A.

congatec offers a cable for connector X60 (see section 1.2.2 “Optional Accessories"). For more information, contact congatec technical solution department.

5.7 Ethernet 10/100/1000

The conga-IA4 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.

Table 28 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 - Connectors X57/X58

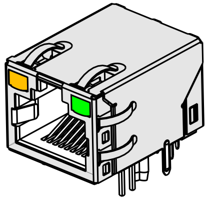


Table 29 LED Descriptions

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.

Note

Connectors X57 and X58 do not support the Intel AMT feature.

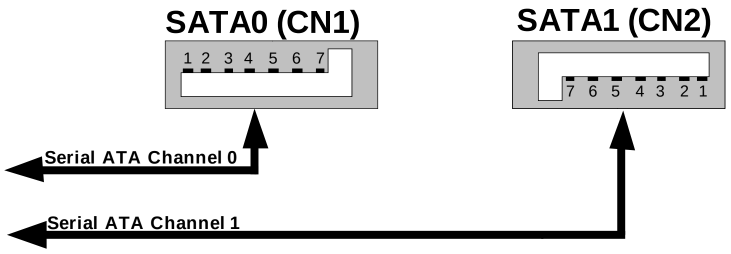
5.8 SATA Interfaces

5.8.1 Standard SATA Ports

The conga-IA4 provides two SATA ports. The SATA ports are routed to connectors CN1/CN2 and support data rates up to 6 Gb/s. The SATA LED on the front panel connector (X38) is lit when there is activity on any of the SATA interfaces.

Table 30 Connectors CN1/CN2 Pinout Description.

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



Connector Type

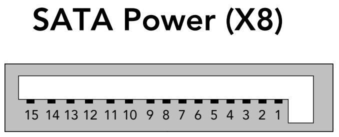
CN1, CN2: Standard SATA connector.

5.8.2 SATA Power

The conga-IA4 provides an internal SATA power for hard drives, on connector X8. This connector supplies 3.3V, 5V and 12V.

Table 31 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		

Connector Type

X8: 15 pin SATA connector.

Note

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

5.8.3 Mini SATA

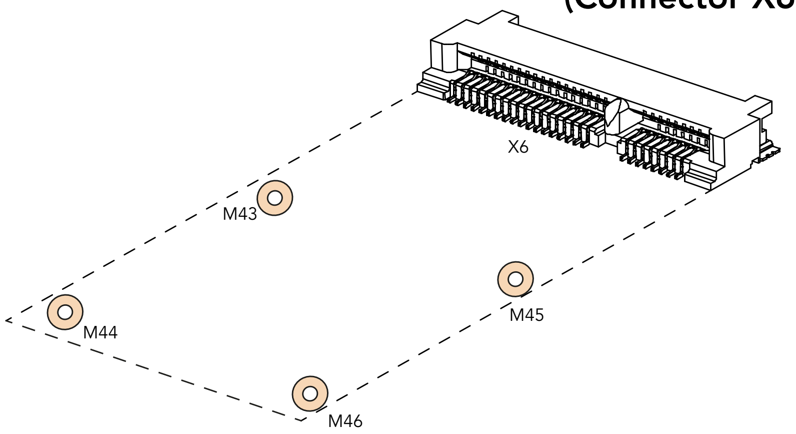
The mini SATA connector X6 on the conga-IA4 is used to connect mSATA devices. This connector shares the SoC's SATA1 signals with SATA connector CN2. Connector CN2 will not function whenever an mSATA card is inserted into the mSATA connector. Therefore, if you plan to use connector CN2, do not insert an mSATA device into connector X6.

The mSATA connector also supports mini PCIe devices. When an mSATA or mPCIe device is connected to X6, the conga-IA4 automatically detects the type of device that is attached.

Table 32 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.
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

mSATA/mPCIe Socket (Connector X6)



Pin	Signal	Pin	Signal
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 pin 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.*

5.9 Display Interfaces

The conga-IA4 supports three simultaneous displays - two DP++ and an LVDS interface.

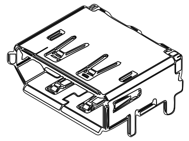
5.9.1 Display Port Interface DP++

The conga-IA4 SBC has two DP++ connectors (X26 and X27) located at the rear I/O panel. The DP++ connectors support DP, HDMI and DVI displays.

Table 33 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++ - Connectors X26/X27



5.9.2 LVDS

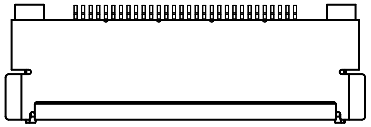
The conga-IA4 offers LVDS interface on connector X32 - a standard 40 pin LVDS connector. The LVDS signals are sourced from the SoC's DDI stream via a multiplexer.

The interface is located on the top side of the SBC and supports 24 bit dual channel, selectable backlight voltage, VESA color mappings, automatic panel detection and up to 1920x1200 resolution.

Table 34 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	LVDS_BKLT_EN
13	LVDS_B1+	33	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 pin ACES connector.

Possible Mating Connector: ACES 88441-40 and ACES 50204-40.

Note

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

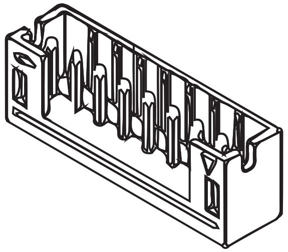
5.9.2.1 Backlight Power Connector

The conga-IA4 provides backlight power on connector X31. The power budget of BKLT_PWR (pins 3 and 4) is limited to 1.5 amps.

Table 35 Connector X31 Pinout Description

Pin	Signal Name	Description
1	LVDS_BKLT_EN	Backlight enable
2	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 pin crimp style connectors.

Possible Mating Connector: Chyao Shiunn JS-1124-08.

Note

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

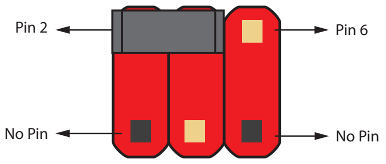
5.9.2.2 Backlight/Panel Power Selection

The conga-IA4 supports different voltages for the panel and backlight connectors. 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.

Table 36 Connector X29 Pinout Description

Pin	Signal Name
1	No Pin
2	3.3V
3	12V
4	Selected LCD power
5	No Pin
6	5V

Panel Voltage Selector - Jumper X29

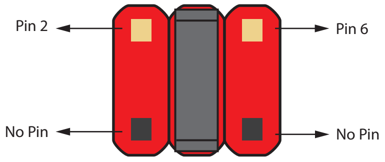


Default Settings:
Pins 2 and 4

Table 37 Connector X30 Pinout Description

Pin	Signal Name
1	No Pin
2	N.C
3	12V
4	Selected backlight power
5	No Pin
6	5V

Backlight Voltage Selector - Jumper X30



Default Settings:
Pins 3 and 4

Connector Type

X29, X30: 2.54mm, 2x3 pin connector (without pins 1 and 5)

5.9.2.3 Monitor OFF connector

The monitor OFF connector (X51) offers the possibility to turn off the displays attached to the conga-IA4.

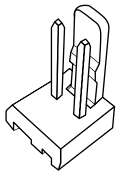
Table 38 Connector X51 Pinout Description

Pin	Function
1	MONITOR_OFF#
2	GND

Connector Type

X51: 2.54mm, 2 pin Molex connector.

Monitor OFF - Connector X51



5.10 PCI Express

The conga-IA4 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.

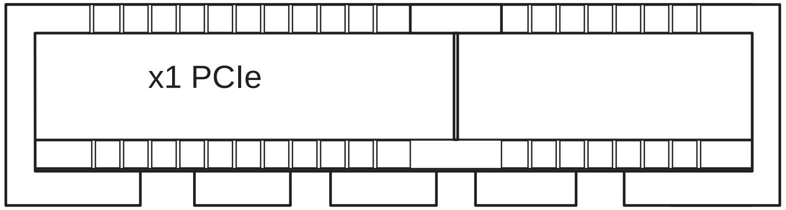
5.10.1 x1 PCIe Slot

The conga-IA4 offers one PCIe x1 slot on connector X9. This connector shares the SoC's PCIe 0 signals with connector X6 (mPCIe/mSATA slot), via a multiplexer. Immediately an mPCIe device is inserted into connector X6, the multiplexer automatically switches the PCIe signals to mPCIe slot (X6).

Table 39 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.
B7	GND	A7	N.C.
B8	+3.3V	A8	N.C.

PCIe Slot
(Connector X9)



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.

5.10.2 Mini PCIe (Half Size)

The conga-IA4 is equipped with a PCIe Mini Card socket (connector X10). PCI Express Mini Card is a unique small size form factor optimized for mobile computing platforms. The small footprint connector makes it possible to mount upgradable, standardized PCI Express Mini Card device to the SBC without additional expenditure of a redesign.

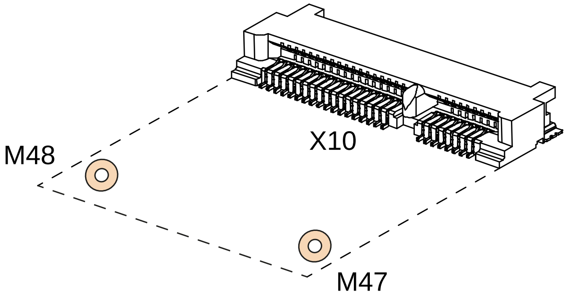
The table below lists the default pinout of the PCI Express Mini Card.

Table 40 mPCIe (Connector X10) Pinout Description

Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3Vaux
3	N.C.	4	GND
5	N.C.	6	+1.5V
7	CLKREQ#	8	N.C.
9	GND	10	N.C.

Pin	Signal	Pin	Signal
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

mPCIe Socket
(Connector X10)



Connector Type

X10: PCIe mini card socket

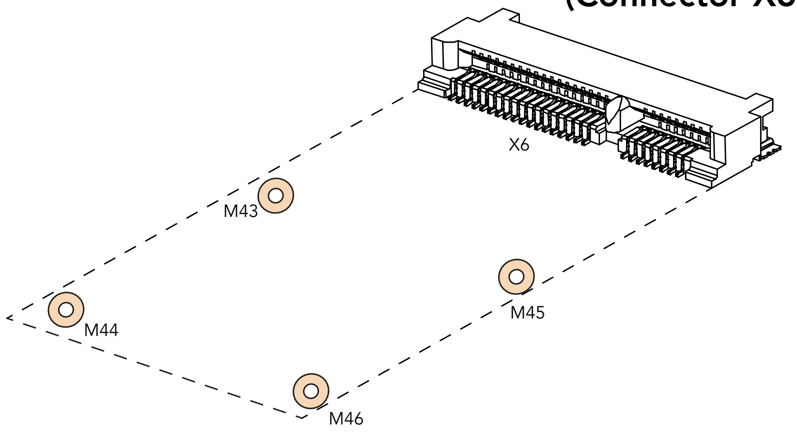
5.10.3 Mini PCIe (Full Size)

The conga-IA4 offers an mPCIe slot on connector X6. This connector shares the SoC's PCIe 0 signals with connector X9 (x1 PCIe slot), via a multiplexer.

The mPCIe slot supports both mPCIe and mSATA devices. When an mPCIe or mSATA device is attached to the mPCIe/mSATA slot (connector X6), the SoC automatically detects the type of device that is attached (via pin 43 - the signal detect pin)

See section 5.10.2 "Mini PCIe (Half Size)" for the mini PCIe Pinout Description.

mSATA/mPCIe Socket (Connector X6)



Connector Type

X6: PCIe mini card socket

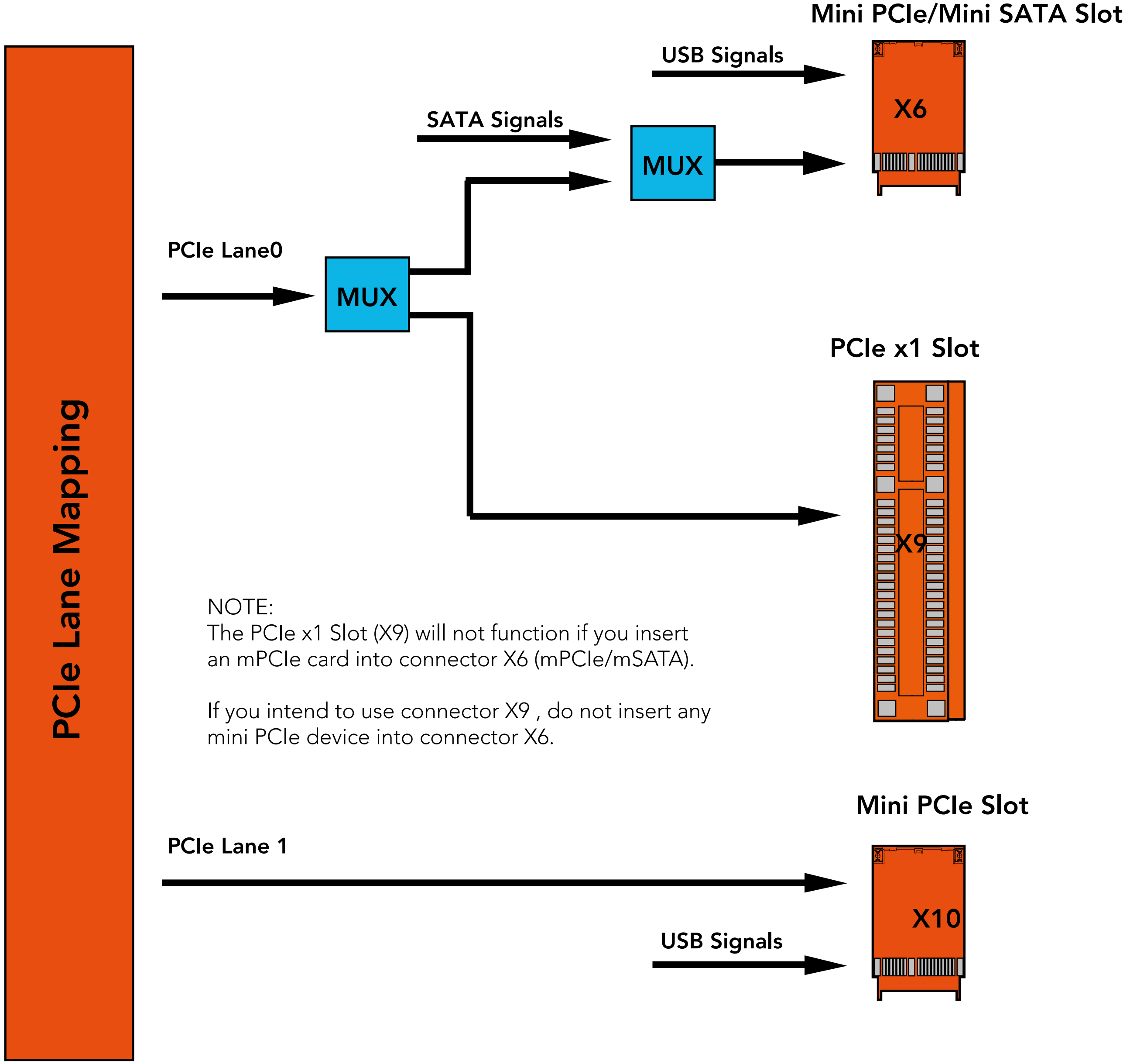
Note

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).

5.10.4 PCI Express Routing

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



NOTE:
The PCIe x1 Slot (X9) will not function if you insert an mPCIe card into connector X6 (mPCIe/mSATA).

If you intend to use connector X9 , do not insert any mini PCIe device into connector X6.

6 Additional Features

6.1 Front Panel Connector

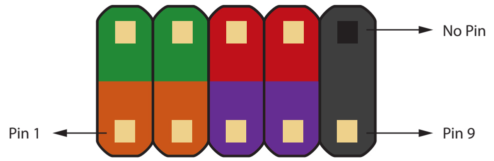
The conga-IA4 SBC supports front panel features such as power button, status LEDs and reset button via connector X38 - a 10-pin internal header. This connector offers one power supply pin (3.3V). The signals FP_LED+ and FP_LED- communicates the system states to two LEDs connected to this header.

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

Table 41 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	SATA_ACT#	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

Front Panel - Connector X38



Connector Type

X38: 10 pin header

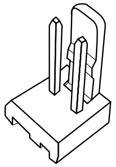
6.2 Case Open Intrusion Connector

The conga-IA4 provides connector X56 for case-open intrusion detection.

Table 42 Case Open Intrusion (X56) Pinout Description

Pin	Function
1	GND
2	CASEOPEN#

Case Open Intrusion - Connector X56



Connector Type

X56: 2.54mm, 2 pin Molex connector.

6.3 Trusted Platform Module – TPM (Optional)

The conga-IA4 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.

Note

The TPM feature is not available by default. You need a customized variant for TPM support.

6.4 congatec Board Controller (cBC)

The conga-IA4 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-IA4 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 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".

6.4.3 Board Information

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

6.4.4 GPIOs

The conga-IA4 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.

6.5 OEM BIOS Customization

The conga-IA4 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:

6.5.1 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.

6.5.2 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.

6.5.3 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.

6.5.4 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.

Note

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.

6.5.5 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.

6.6 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-IA4 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-SBM^3 User's Guide

6.7 API Support (CGOS)

congatec provides an API that allows application software developers to easily integrate the BIOS customization features mentioned above 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 .

6.8 Thermal/Voltage Monitoring

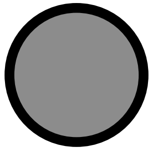
The conga-IA4 SBC features three temperature sensors - the CPU, memory and board controller sensors.

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).

6.9 Beeper

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

PC Beeper (M10)



6.10 External System Wake Event

The conga-IA4 supports LAN, USB, PCIe and PWRBTN driven wake up events.

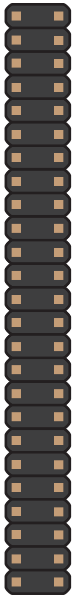
6.11 Feature Connector

The conga-IA4 provides an internal 50 pol. 2mm pin header as feature connector. The pinout is described below:

Table 43 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

Feature Connector X34

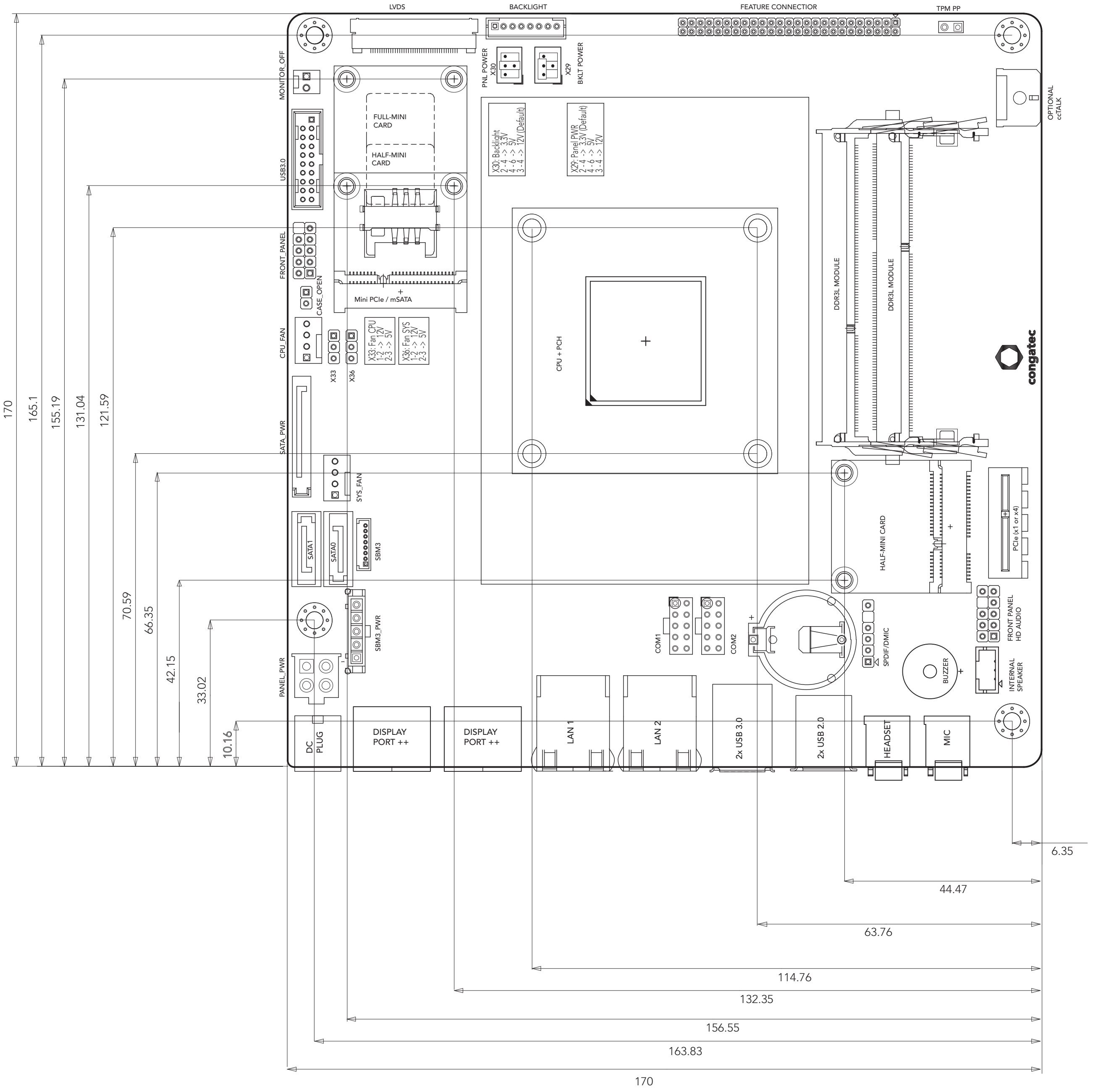


Pin	Signal	Pin	Signal
27	GPI2	28	GPI3
29	GPI4	30	GPI5
31	GPI6	32	GPI7
33	PM_SLP_S3#	34	PM_SLP_S5#
35	PM_SLP_S4#	36	LID_BTN#
37	SLP_BTN#	38	PM_THRM#
39	WDOUT	40	WDTRIG
41	I2C_DAT	42	PWR_OK
43	SPI_CS#	44	I2C_CLK
45	SPI_SO	46	BIOS_DISABLE#
47	SPI_CLK	48	SPI_SI
49	+V5A	50	GND

Connector Type

X34: 2mm, 2 x 25 pin header.

7 conga-IA4 Mechanical Drawing



8 BIOS Setup Description

The following section describes the BIOS setup program. The BIOS setup program can be used to view and change the BIOS settings for the module. Only experienced users should change the default BIOS settings.

8.1 Entering the BIOS Setup Program.

The BIOS setup program can be accessed by pressing the <DEL> or <ESC> key during POST.

8.1.1 Boot Selection Popup

Press the <F11> key during POST to access the Boot Selection Popup menu. A selection menu displays immediately after POST, allowing the operator to select either the boot device that should be used or an option to enter the BIOS setup program.

8.2 Setup Menu and Navigation

The congatec BIOS setup screen is composed of the menu bar, left frame and right frame. The menu bar is shown below:

Main	Advanced	Chipset	Boot	Security	Save & Exit

The left frame displays all the options that can be configured in the selected menu. Grayed-out options cannot be configured. Only the blue options can be configured. When an option is selected, it is highlighted in white.

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.

Note

Entries in the option column that are displayed in bold indicate BIOS default values.

The setup program uses a key-based navigation system. Most of the keys can be used at any time while in setup. The table below explains the supported keys:

Key	Description
← → Left/Right	Select a setup menu (e.g. Main, Boot, Exit).
↑ ↓ Up/Down	Select a setup item or sub menu.
+ - Plus/Minus	Change the field value of a particular setup item.
Tab	Select setup fields (e.g. in date and time).
F1	Display General Help screen.
F2	Load previous settings.
F9	Load optimal default settings.
F10	Save changes and exit setup.
ESC	Discard changes and exit setup.
ENTER	Display options of a particular setup item or enter submenu.

8.3 Main Setup Screen

When you first enter the BIOS setup, you will see the main setup screen. The main setup screen reports BIOS, processor, memory and board information and is for configuring the system date and time. You can always return to the main setup screen by selecting the 'Main' tab.

Feature	Options	Description
Main BIOS Version	No option	Displays the main BIOS version.
OEM BIOS Version	No option	Displays the additional OEM BIOS version.
Build Date	No option	Displays the date the BIOS was built.
Product Revision	No option	Displays the hardware revision of the board.
Serial Number	No option	Displays the serial number of the board.
BC Firmware Revision	No option	Displays the firmware revision of the congatec board controller.
MAC Address (1st Ethernet)	No option	Displays the MAC address of the onboard Ethernet controller.
MAC Address (2nd Ethernet)	No option	Displays the MAC address of the onboard Ethernet controller.
Boot Counter	No option	Displays the number of boot ups. **Note:** The value is limited to 16777215.
Running Time	No option	Displays the board-runtime in hours. **Note:** The value is limited to 65535.
Microcode Patch	No option	Displays the processor's microcode revision.

Feature	Options	Description
Total Memory	No option	Displays total amount of low voltage DDR3 on the system.
Intel® GOP Driver	No option	Displays the GOP driver version.
Sec RC Version	No option	Displays the SEC revision.
TXE FW Version	No option	Displays the Trusted Execution Environment (TXE) firmware revision.
System Language	English	Displays the default system language.
System Date	Day of week, month/day/year	Specifies the current system date **Note:** The date is in month/day/year format.
System Time	Hour:Minute:Second	Specifies the current system time. **Note:** The time is in 24-hour format.

8.4 Advanced Setup

Select the advanced tab from the setup menu to enter the advanced BIOS setup screen. The menu is used for setting advanced features and only features described within this user's guide are listed.

Main	Advanced	Chipset	Boot	Security	Save & Exit
	Watchdog				
	Hardware Health Monitoring				
	Graphics				
	Intel® I211 Gigabit Network (Ethernet 1)				
	Intel® I211 Gigabit Network (Ethernet 2)				
	Driver Health				
	Trusted Computing				
	RTC Wake				
	Reserve Legacy Interrupt				
	ACPI				
	Super IO				
	Serial Port Console Redirection				
	CPU				
	PPM Configuration				
	Thermal Configuration				
	SATA				
	LPSS & SCC Configuration				
	PCI & PCI Express				

Main	Advanced	Chipset	Boot	Security	Save & Exit
	UEFI Network Stack				
	CSM & Option ROM Control				
	Info Report Configuration				
	NVMe Configuration				
	SDIO Configuration				
	USB				
	Diagnostic Settings				
	Platform Trust Technology				
	Security Configuration				
	IntelMRT Configuration				
	PC Speaker				

8.4.1 Watchdog Submenu

Feature	Options	Description
POST Watchdog	**Disabled** 30sec 1min 2min 5min 10min 30min	Set the timeout value for the POST watchdog. The watchdog is only active during the POST of the system and provides a facility to prevent errors during boot up by performing a reset.
Stop Watchdog for User Interaction	No **Yes**	Select whether the POST watchdog should be stopped during the popup of the boot selection menu or while waiting for the setup password.
Runtime Watchdog	**Disabled** One-time Trigger Single Event Repeated Event	Select the operating mode of the runtime watchdog: 'One-time Trigger' - Disables watchdog after first trigger. 'Single Event' - Executes every stage only once before the watchdog is disabled. 'Repeated Event' - Executes last stage repeatedly until reset. **Note:** This watchdog will be initialized just before the operating system starts booting.
Delay	**Disabled** 10sec 30sec 1min 2min 5min 10min 30min	The runtime watchdog is delayed for the selected time. **Note:** Use this feature to ensure that the operating system has enough time to load.

Feature	Options	Description
Event 1	ACPI Event **Reset** Power Button	Select the type of event that will be generated when timeout 1 is reached.
Event 2	**Disabled** ACPI Event Reset Power Button	Select the type of event that will be generated when timeout 2 is reached.
Event 3	**Disabled** ACPI Event Reset Power Button	Select the type of event that will be generated when timeout 3 is reached.
Timeout 1	1sec 2sec 5sec 10sec **30sec** 1min 2min 5min 10min 30min	Set the timeout value for the first stage watchdog event.
Timeout 2	Same as 'Timeout 1'	Same as 'Timeout 1'.
Timeout 3	Same as 'Timeout 1'	Same as 'Timeout 1'.
Watchdog ACPI Event	**Shutdown** Restart	Select the operating system event that is initiated by the watchdog ACPI event. This feature performs a critical but orderly operating system shutdown or restart.

Note

In ACPI mode, the "Watchdog ACPI Event" handler cannot restart or shutdown the OS directly. For this reason, the congatec BIOS will

- *For shutdown: execute an over-temperature notification. This causes the operating system to shut down in an orderly fashion*
- *For restart: report an ACPI fatal error to the operating system.*

8.4.2 Hardware Health Monitoring Submenu

Feature	Options	Description
CPU Temperature	No option	Displays the CPU temperature in °C.
Board Temperature	No option	Displays the board temperature in °C.
TS AMBIENT DXP	No option	Displays the module environment temperature in °C.
DIMM DXP	No option	Displays the module DIMM DXP Temperature in °C.
3.3V Standard	No option	Displays the actual voltage of the 3.3V standard power supply.
5V Standard	No option	Displays the actual voltage of the 5V standard power supply.
12V Standard	No option	Displays the actual voltage of the 12V standard power supply.
VCORE	No option	Displays the actual voltage of the VCORE power supply.
System Fan Speed	No option	Displays the System Fan Speed in RPM.
CPU Fan Speed	No option	Displays the CPU fan speed in RPM.
System Fan Mode	Smart Mode **PWM Mode**	Configures the System Fan Mode
System Fan PWM Speed Setting	0% 10% 20% 30% 40% 50% 60% 70%, 80% 90% **100%**	Select minimum/start fan speed to be set when the start temperature of the control slope is reached.
CPU Fan Speed Mode	Smart Mode **PWM Mode**	Configures the CPU Fan Mode

Feature	Options	Description
CPU Fan PWM Speed Setting	0% 10% 20% 30% 40% 50% 60% 70%, 80% 90% **100%**	Select minimum/start fan speed to be set when the start temperature of the control slope is reached.

8.4.3 Graphics Submenu

Feature	Options	Description
Active LFP Configuration	No Local Flat Panel **Integrated LVDS**	Select the active local flat panel (LFP) configuration.
Always Try Auto Panel Detect	**No** Yes	If set to 'Yes', the BIOS will use the EDID™ data set in an external EEPROM to configure the LFP. In case it cannot be found, the data set selected under 'Local Flat Panel Type' will be used.
Local Flat Panel Type	**Auto** VGA 640x480 1x18 (002h) VGA 640x480 1x18 (013h) WVGA 800x480 1x18 (01Fh) WVGA 800x480 1x24 (01Bh) SVGA 800x600 1x18 (01Ah) XGA 1024x768 1x18 (006h) XGA 1024x768 2x18 (007h) XGA 1024x768 1x24 (008h) XGA 1024x768 2x24 (012h) WXGA 1280x800 1x18 (01Eh) WXGA 1280x768 1x24 (01Ch) SXGA 1280x1024 2x24 (00Ah) SXGA 1280x1024 2x24 (018h) UXGA 1600x1200 2x24 (00Ch) HD 1920x1080 2x24 (01Dh) WUXGA 1920x1200 2x18 (015h) WUXGA 1920x1200 2x24 (00Dh) Customized EDID™ 1 Customized EDID™ 2 Customized EDID™ 3	Select a predefined LFP type or choose 'Auto' to let the BIOS automatically detect and configure the attached LVDS panel. Auto detection is performed by reading an EDID™ data set via the video I²C bus. The number in brackets specifies the congatec internal number of the respective panel data set. **Note:** Customized EDID™ utilizes an OEM defined EDID™ data set stored in the BIOS flash device.

Feature	Options	Description
Backlight Inverter Type	None **PWM** I2C	Select the type of backlight inverter: 'PWM' - IGD PWM signal. 'I2C' - I2C backlight inverter device connected to the video I²C bus.
PWM Inverter Polarity	**Normal** Inverted	Select PWM inverter polarity. **Note:** This feature is only visible if the 'Backlight Inverter Type' is set to 'PWM'.
PWM Inverter Frequency (Hz)	**200** - 40000	Set the PWM inverter frequency in Hz. **Note:** This feature is only visible if the 'Backlight Inverter Type' is set to 'PWM'.
Backlight Setting	0% 10% 25% 40% 50% 60% 75% 90% **100%**	Set backlight value in percentage of the maximum setting.
Inhibit Backlight	**No** Permanent Until End Of POST	Select whether the backlight enable signal should be activated when the panel is activated, remain inhibited until the end of BIOS POST, or remain inhibited permanently.
Force LVDS Backlight	No **Yes**	If set to 'Yes', this feature forces LVDS enable and LVDS VDD signals unconditionally
LVDS SSC	**Disabled** 0.5% 1.0% 1.5% 2.0% 2.5%	Select LVDS spread-spectrum clock modulation depth. **Note:** This feature performs center spreading with a fixed modulation frequency of 32.9kHz.
Digital Display Interface 1	**Auto Selection** Disabled DisplayPort HDMI/DVI	Select the output type of the DDI 1.
Digital Display Interface 2	**Auto Selection** Disabled DisplayPort HDMI/DVI	Select the output type of the DDI 2.

8.4.4 Intel® I211 Gigabit Network Connection (Ethernet 1) Submenu

Feature	Options	Description
► NIC Configuration	Submenu	Configure Boot Protocol, Wake on LAN, Link Speed and VLAN.
Blink LEDs	**0**	Identify the physical network port by blinking the associated LED.
UEFI Driver	No option	Displays the UEFI Driver version.
Adapter PBA	No option	Displays the Adapter PBA.
Chip Type	No option	Displays the type of the Chip.
PCI Device ID	No option	Displays the PCI Device ID.
Bus:Device:Function	No option	
Link Status	**Disconnected**	Displays the Link Status.
MAC Address	No option	Displays the MAC Address.

8.4.5 Intel® I211 Gigabit Network Connection (Ethernet 2) Submenu

Feature	Options	Description
► NIC Configuration	Submenu	Configure Boot Protocol, Wake on LAN, Link Speed and VLAN.
Blink LEDs	**0**	Identify the physical network port by blinking the associated LED.
UEFI Driver	No option	Displays the UEFI Driver version.
Adapter PBA	No option	Displays the Adapter PBA.
Chip Type	No option	Displays the type of the Chip.
PCI Device ID	No option	Displays the PCI Device ID.
Bus:Device:Function	No option	
Link Status	**Disconnected**	Displays the Link Status.
MAC Address	No option	Displays the MAC Address.

8.4.5.1 NIC Configuration Submenu

Feature	Options	Description
Link Speed	**Auto Negotiated** 10 Mbps Half 10 Mbps Full 100 Mbps Half 100 Mbps Full	Set the port speed for the selected boot protocol.

Feature	Options	Description
Wake on LAN	**Enabled** Disabled	Enable or disable the Wake on LAN (WOL) feature

8.4.6 Driver Health Submenu

Feature	Options	Description
▶Intel® PRO/1000	Submenu	Displays health status for the drivers/controllers connected to the system.

8.4.7 Trusted Computing Submenu

Feature	Options	Description
Security Device Support	Disabled **Enabled**	Enable or disable TPM support. **Note:** Please restart your system for the change to take effect.
User Confirmation	Disabled **Enabled**	Enable or disable user confirmation requests for certain transactions.
TPM State	**Disabled** Enabled	Enable or disable TPM chip. **Note:** The system may restart several times during POST to acquire the target state.
Pending operation	**None** Enable Take Ownership Disable Take Ownership TPM Clear	Perform selected TPM chip operation. **Note:** The system may restart several times during POST to perform the selected operation.

8.4.8 RTC Wake Submenu

Feature	Options	Description
Wake System At Fixed Time	**Disabled** Wake from S5 only Wake from S4 and S5 Wake from S3, S4 and S5	Set system wake mode on alarm event. When enabled, system will wake from the specified Sx states on the hr:min:sec specified.
Wake up hour	**0** - 23	Specify the wake up hour. For example: Enter "3" for 3am and "15" for 3pm.
Wake up minute	**0** - 59	Specify the wake up minute.
Wake up second	**0** - 59	Specify the wake up second.

8.4.9 Reserve Legacy Interrupt Submenu

Feature	Options	Description
Reserve Legacy Interrupt 1, 2, 3	**None** IRQ3 IRQ4 IRQ5 IRQ6 IRQ10 IRQ11 IRQ14 IRQ15	Use this feature to reserve the interrupt for a legacy bus device. **Note:** The selected interrupt will not be assigned to a PCI/PCIe device.

8.4.10 ACPI Submenu

Feature	Options	Description
Enable ACPI Auto Configuration	**Disabled** Enabled	Enable or disable BIOS ACPI auto configuration
Hibernation Support	Disabled **Enabled**	Enable or disable the system's ability to hibernate (OS S4 sleep state). **Note:** If you want to use this feature, please ensure that the operating system supports it.
ACPI Sleep State	Suspend Disabled **S3 (Suspend to RAM)**	Select the state used for ACPI system sleep/suspend.
Lock Legacy Resources	**Disabled** Enabled	Enable this feature to lock legacy resources.
LID Button Support	Disabled **Enabled**	If this feature is enabled, COM Express LID# signal acts as ACPI lid.
Sleep Button Support	Disabled **Enabled**	If this feature is enabled, COM Express SLEEP# signal acts as ACPI sleep button.

8.4.11 Super IO Submenu

Feature	Options	Description
Super IO Chip	No option	Displays super IO chip.
▶Serial Port 1 Configuration	Submenu	Serial port 1 submenu.
▶Serial Port 2 Configuration	Submenu	Serial port 2 submenu.

8.4.11.1 Serial Port 1 Configuration Submenu

Feature	Options	Description
Serial Port	Disabled **Enabled**	Enable or disable serial port (COM).
Device Settings	No option	Displays current device settings.

Change Settings	**Auto**
	IO=3F8; IRQ=4;
	IO=3F8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=2F8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=3E8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=2E8; IRQ=3,4,5,6,7,9,10,11, 12;
		Serial Port 1 configuration options.

8.4.11.2 Serial Port 2 Configuration Submenu

Feature	Options	Description
Serial Port	**Enabled** Disabled	Enable or disable serial port (COM).

Change Settings	**Use Automatic Settings**
	IO=2F8; IRQ=3;
	IO=3F8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=2F8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=3E8; IRQ=3,4,5,6,7,9,10,11, 12;
	IO=2E8; IRQ=3,4,5,6,7,9,10,11, 12;
		Serial Port 2 configuration options.

Device Mode	**Standard Serial Port Mode** IrDA Active pulse 1.6 uS IrDA Active pulse 3/16 bit time ASKIR Mode	Select the serial port mode.

8.4.12 Serial Port Console Redirection Submenu

Feature	Options	Description
COM0 Console Redirection	**Disabled** Enabled	Enable or disable serial port 0 console redirection.
►Console Redirection Settings	Submenu	Opens 'Console Redirection Settings' submenu.
COM1 Console Redirection	Disabled Enabled	Enable or disable serial port 0 console redirection.

Feature	Options	Description
►Legacy Console Redirection Settings	Submenu	Opens 'Legacy Console Redirection Settings' submenu.
Serial Port for Out-of-Band Management / EMS Console Redirection	**Disabled** Enabled	Enable or disable 'Serial Port for Out-of-Band Management / Windows Emergency Management Services'.
►Console Redirection Settings	Submenu	Opens 'Console Redirection Settings' submenu.

8.4.12.1 Console Redirection Settings Submenu

Feature	Options	Description
Terminal Type	VT100 VT100+ VT-UTF8 **ANSI**	Set the terminal type.
Baudrate	9600 19200 38400 57600 **115200**	Set baud rate.
Data Bits	7 **8**	Set number of data bits.
Parity	**None** Even Odd Mark Space	Set parity.
Stop Bits	**1** 2	Set number of stop bits.
Flow Control	**None** Hardware RTS/CTS	Set flow control.
VT-UTF8 Combo Key Support	Disabled **Enabled**	Enable or disable the VT-UTF8 combination key support for ANSI/VT100 terminals.
Recorder Mode	**Disabled** Enabled	Enable this feature to only send text output over the terminal. **Note:** This feature is helpful to capture and record terminal data.
Resolution 100x31	**Disabled** Enabled	Enable or disable extended terminal resolution.
Legacy OS Redirection Resolution	**80x24** 80x25	Select the number of rows and columns for the legacy operating system redirection.

Feature	Options	Description
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select the function key and keypad for Putty.
Redirection After BIOS POST	**Enabled** Disabled	If BootLoader is selected, Legacy console redirection is disabled before booting to Legacy OS. Default value is 'Always Enable' which means Legacy console redirection is enabled for Legacy OS.

8.4.13 Legacy Console Redirection Settings

Feature	Options	Description
Legacy Console Redirection Port	**COM0** COM1	Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

8.4.13.1 Console Redirection Settings Out-of-Band Management Submenu

Feature	Options	Description
Out-of-Band Mgmt Port	**COM0** COM1	Microsoft Windows Emergency Management Services (EMS) allows remote management of a Windows Server operating system through a serial port.
Terminal Type	VT100 VT100+ **VT-UTF8** ANSI	Set the terminal type.
Baudrate	9600 19200 38400 57600 **115200**	Set the baud rate.
Flow Control	**None** Hardware RTS/CTS Sotware Xon/Xoff	
Data Bits	**8**	Set the number of data bits.
Parity	**None**	Set the parity.
Stop Bits	**1**	Set the number of stop bits.

8.4.14 CPU Configuration Submenu

Feature	Options	Description
►Socket 0 CPU Information	Submenu	Socket specific CPU information.
CPU Speed	No option	Displays the CPU clock frequency.
64-bit	No option	Displays 64-bit support information.
Limit CPUID Maximum	**Disabled** Enabled	If enabled, the processor limits the maximum CPUID input value to 03h when queried, even if the processor supports a higher CPUID input value. If disabled, the processor returns the actual maximum CPUID input value of the processor when queried. **Note:** Limiting the CPUID input value may be required for older operating systems that cannot handle the extra CPUID information returned when using the full CPUID input value.
Bi-directional PROCHOT	Disabled **Enabled**	If enabled, external agents can drive PROCHOT# to throttle the processor. If disabled, a processor thermal sensor trips (either core), the PROCHOT# will be driven.
Intel® Virtualization Technology	Disabled **Enabled**	Enable or disable support for the Intel virtualization technology.
Power Technology	Disable **Energy Efficient** Custom	Select the power technology schema for the CPU.
EIST	Disabled **Enabled**	Enable or disable Enhanced Intel SpeedStep Technology (EIST).
Turbo Mode	Disabled **Enabled**	Enable or disable turbo mode.
P-State Coordination	**HW_ALL** SW_ALL SW_ANY	Set P-state coordination type.
Package C State Limit	**C1** C3 C6 C7	Set package C-state limit.

8.4.14.1 Socket 0 CPU Information Submenu

Feature	Options	Description
CPU Name	No option	Displays the socket specific CPU name.
CPU Signature	No option	Displays the CPU signature number.
Microcode Patch	No option	Displays the CPU microcode patch number.
Max CPU Speed	No option	Displays the maximal CPU clock frequency.
Min CPU Speed	No option	Displays the minimal CPU clock frequency.

Feature	Options	Description
Processor Cores	No option	Displays the number of CPU core on Socket CPU.
Intel® HT Technology	No option	Displays the Intel® HT Technology support information.
Intel® VT-x Technology	No option	Displays the Intel VT-x technology support information.
L1 Data Cache	No option	Displays the Socket L1 data cache information.
L1 Code Cache	No option	Displays the Socket L1 code cache information.
L2 Cache	No option	Displays the Socket L2 cache information.
L3 Cache	No option	Displays the Socket L3 cache information.

8.4.15 PPM Configuration Submenu

Feature	Options	Description
EIST	Disabled **Enabled**	Enable or disable Enhanced Intel SpeedStep Technology (EIST).
CPU C state Report	Disabled **Enabled**	Enable or disable CPU state report to OS.
Max CPU C state	C7 C6 **C1**	Select maximum CPU C-state supported by the CPU.
SOix	**Disabled** Enabled	Enable or disable CPU SOix state support.

8.4.16 Thermal Configuration

Feature	Options	Description
DTS	Enabled **Disabled**	Enable or disable Digital Thermal Sensor (DTS).
Critical Trip Point	Default: **95** 0 - 100	Set the temperature of the ACPI critical trip point at which the operating system will shut the system off.
OS Hibernate Temperature	Default: **85** 0 - 110	Set the temperature that causes the operating system to trigger the system to hibernate.
Passive Trip Point	Default: **85** 0 - 90	Set the temperature of the ACPI passive trip point at which the operating system will begin throttling the processor.
Full Speed Fan Trip Point	Default: **80** 0 - 90	Set the temperature at which the fan is activated at full speed.
Half Speed Fan Trip Point	Default: **60** 0 - 90	Set the temperature at which the fan is activated at half speed.

Feature	Options	Description
Fan Hysteresis	0 - **7**	Set number of degrees for the temperature to decrease before the fan is switched off again.

8.4.17 SATA Submenu

Feature	Options	Description
SATA Controller	**Enabled** Disabled	Enable or disable SATA onboard SATA controller(s).
SATA Mode Selection	**AHCI**	Select SATA controller mode.
SATA Interface Speed	Gen1 **Gen2** Gen3	Select SATA Interface Speed. **Note:** CHV A1 always with Gen1 Speed.
SATA Test Mode	Enabled **Disabled**	Enable only during verification measurements.
Aggressive LPM Support	**Enabled** Disabled	Enable PCH to aggressively enter link power state.
►Software Feature Mask Configuration	Submenu	
SATA Port 0	**Enabled** Disabled	Enable or disable SATA port 0.
Spin Up Device	Enabled **Disabled**	If enabled for any ports, staggered spin up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot.
Device Sleep Support	Enabled **Disabled**	Enable or disable device sleep support on that port.
SATA Port 1	**Enabled** Disabled	Enable or disable SATA port 1.
Spin Up Device	Enabled **Disabled**	If enabled for any ports, staggered spin up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise, all drives spin up at boot.
Device Sleep Support	Enabled **Disabled**	Enable or disable device sleep support on that port.

8.4.17.1 Software Feature Mask Configuration Submenu

Feature	Options	Description
HDD Unlock	**Enabled** Disabled	If enabled, indicates that the HDD password unlock in the operating system is enabled.
LED Locate	**Enabled** Disabled	If enabled, indicates that the LED/SGPIO hardware is attached and ping to locate feature is enabled on the OS.

8.4.18 LPSS & SCC Configuration Submenu

Feature	Options	Description
SCC eMMC Support	**ACPI Mode** PCI Mode Disabled	Enable or disable SCC eMMC support.
eMMC Secure Erase	Enabled **Disabled**	Enable or disable eMMC secure erase support.
SCC SD Card Support (D18:F0)	**ACPI Mode** PCI Mode Disabled	Enable or disable SCC SD card support.
SD Card 1.8v Switching Delay	**0** - 999ms	Set SD card 1.8v switching delay.
SD Card 3.3v Discharge Delay	Default: **250** 0 - 999ms	Set SD card 3.3v discharge delay.
LPSS with GPIO Devices Support	Disabled **Enabled**	If this feature is disabled, all LPSS devices are disabled.
LPSS DMA #1	**ACPI Mode** PCI Mode Disabled	Enable or disable LPSS DMA #1 support.
LPSS DMA #2	**ACPI Mode** PCI Mode Disabled	Enable or disable LPSS DMA #2 support.
LPSS I2C #3	**ACPI Mode** PCI Mode Disabled	Enable or disable LPSS I2C #3 support.
Runtime D3 Support	**Enabled** Disabled	Enable or disable Runtime D3 support.
LPSS I2C #4	ACPI Mode PCI Mode **Disabled**	Enable or disable LPSS I2C #4 support.

8.4.19 PCI & PCI Express

Feature	Options	Description
PCI Bus Driver Version	No option	Displays PCI bus driver version.

Feature	Options	Description
PCI Latency Timer	**32 PCI Bus Clocks** 64 PCI Bus Clocks 96 PCI Bus Clocks 128 PCI Bus Clocks 160 PCI Bus Clocks 192 PCI Bus Clocks 224 PCI Bus Clocks 248 PCI Bus Clocks	Select the value to be programmed into PCI latency timer register.
PCI-X Latency Timer	32 PCI Bus Clocks **64 PCI Bus Clocks** 96 PCI Bus Clocks 128 PCI Bus Clocks 160 PCI Bus Clocks 192 PCI Bus Clocks 224 PCI Bus Clocks 248 PCI Bus Clocks	Select the value to be programmed into PCI latency timer register.
VGA Palette Snoop	**Disabled** Enabled	Enable or disable VGA palette registers snooping.
PERR# Generation	**Disabled** Enabled	Enable or disable PCI device to generate PERR#.
SERR# Generation	**Disabled** Enabled	Enable or disable PCI device to generate SERR#.
Above 4G Decoding	**Disabled** Enabled	Enable this feature to decode 64-bit capable devices in Above 4G address space. **Note:** Please ensure that the system supports 64-bit PCI decoding if you want to use this feature.
Don't Reset VC-TC Mapping	**Disabled** Enabled	If the system has virtual channels, software can reset the traffic class mapping through virtual channels to its default state. **Note:** Enabling this feature will not modify VC resources.

8.4.20 UEFI Network Stack

Feature	Options	Description
Network Stack	Enabled **Disabled**	Enable or disable the UEFI network stack.
IPv4 PXE Support	**Enabled** Disabled	If this feature is disabled, IPV4 PXE boot option will not be created.
IPv6 PXE Support	**Enabled** Disabled	If this feature is disabled, IPV6 PXE boot option will not be created.
PXE boot wait time	**0** - 5	Set wait time to press ESC key to abort the PXE boot.

Feature	Options	Description
Media detect count	**1** - 50	Set the number of times to check for the presence of media.

8.4.21 CSM & Option ROM Control Submenu

Feature	Options	Description
CSM Support	**Enabled** Disabled	Enable or disable the compatibility support module.
CSM16 Module Version	No option	Displays CSM module version number.
Gate A20 Active	**Upon Request** Always	Configure legacy gate A behavior.
Option ROM Messages	**Force BIOS** Keep Current	Enable or disable option ROM message.
INT19 Trap Response	**Immediate** Postponed	Set BIOS reaction on INT19 trapping: 'Immediate' - Executes the trap right away. 'Postpone' - Executes the trap during legacy boot.
Boot Option Filter	**UEFI and Legacy** Legacy Only UEFI Only	Select which devices / boot loaders the system should boot to.
Network	Do not launch **UEFI only** Legacy only	Select the execution of UEFI and legacy Network option ROMs.
Storage	Do not launch **UEFI only** Legacy only	Select the execution of UEFI and legacy Storage option ROMs.
Video	Do not launch UEFI only **Legacy only**	Select the execution of UEFI and legacy Video option ROMs
Other PCI Devices	**UEFI only** Legacy only Do not launch	Select the execution of UEFI and legacy option ROMs for any PCI device other than network, video and storage.

8.4.22 Info Report Configuration

Feature	Options	Description
POST Report	**Disabled** Enabled	Enable or disable POST report support.

Feature	Options	Description
Delay Time	0 - 10 Until Press ESC	Set POST report time in seconds or to wait until ESC key is pressed.
Error Message Report	**Disabled** Enabled	Enable or disable error message support.
Summary Screen	**Disabled** Enabled	Enable or disable summary screen.
Delay Time	0 - 10 Until Press ESC	Set summary screen from 0 to 10 seconds or select to wait till ESC key is pressed.

8.4.23 NVMe Submenu

Feature	Options	Description
NVMe controller and Drive Information	No option	

8.4.24 SDIO Submenu

Feature	Options	Description
SDIO Access Mode	Auto ADMA SDMA PIO	'Auto Option' - Access SD device in DMA mode if controller supports it, otherwise in PIO mode. 'MDA Option' - AccessSD device in DMA mode. 'PIO Option' - Access SD device in PIO mode.

8.4.25 USB Submenu

Feature	Options	Description
USB Module Version	No option	Displays the version of the USB module.
USB Controllers	No option	Displays the available USB controllers.
USB Devices	No option	Displays the detected USB devices.
Legacy USB Support	**Enabled** Disabled Auto	‘Enable’ - Enables legacy USB support. ‘Disable’ - Keeps USB devices available only for EFI applications and BIOS setup. ‘Auto’ - Disables legacy support if no USB devices are connected.
xHCI Hand-off	Enabled **Disabled**	This is a workaround for operating systems without xHCI hand-off support. **Note:** If this feature is enabled, the xHCI ownership change should be claimed by xHCI operating system driver.

Feature	Options	Description
USB Mass Storage Driver Support	Disabled **Enabled**	Enable or disable mass storage driver support.
Port 60/64 Emulation	Disabled **Enabled**	Enable or disable I/O port 60h/64h emulation support. **Note:** Enable this feature for the complete USB keyboard legacy support for non-USB aware operating systems.
USB Transfer Timeout	1 sec 5 sec 10 sec **20 sec**	Set the timeout value for control, bulk, and interrupt transfers.
Device Reset Timeout	10 sec **20 sec** 30 sec 40 sec	Set USB legacy mass storage device start unit command timeout.
Device Power-Up Delay Selection	**Auto** Manual	Select whether the delay time for a USB device to report itself properly to the host controller should be set automatically or manually. If set to 'Auto', the delay is 100ms for a root port or the value is derived from the hub descriptor for a hub port.
Device Power-Up Delay Value	Default: **5** 0 - 40	Set power-up delay value in seconds.
SanDisk Cruzer Micro 8.01	**Auto** Floppy Forced FDD Hard Disk CD-ROM	Select mass storage device emulation type: 'Auto' - Enumerates devices according to their media format. **Note:** Drives without media will be emulated according to the drive type.

8.4.26 Security Configuration

Feature	Options	Description
Relay Interface	**Disabled** I2C SMBus BC Diagnostic Console	Select the relay interface to which the POST code will be redirected.
Primary port Addr. Lowbyte (Dec)	0-**128**	Set the Address for the primary debug port. The usual address value is 0x80. However, any multiple of 8 is valid for a primary debug port address, i.e. the lower three bits must be zero.
Primary port Addr. Highbyte (Dec)	**0**-128	Set the Address for the primary debug port. The usual address value is 0x80. However, any multiple of 8 is valid for a primary debug port address, i.e. the lower three bits must be zero.
Relay Device Address (Dec)	0-256	Specify the I2C/SMBus device Address of e.g. a 7-Segment LCD. The factory setting for the SparkFun device is 0xE2. However, any even device address (bit 0 = 0) can be specified.
BC Diagnostic Console Interface	**Disable** BC AUX Port	Select the interface to be used for the BC Diagnostic Console output or disable the BC Diagnostic Console output.

Feature	Options	Description
Parity Bit	**No Parity** Even Parity Odd Parity	Choose the parity bits for the BC Diagnostic Console Interface.
Stop Bits	**1 Stop Bit** 2 Stop Bits	Choose the stop bits for the BC Diagnostic Console Interface.
Data Bits	5 Data Bits 6 Data Bits 7 Data Bits **8 Data Bits**	Choose the data bits for the BC Diagnostic Console Interface.
Baudrate	1200 Baud 2400 Baud 4800 Baud **9600 Baud** 19200 Baud 38400 Baud	Choose the baudrate for the BC Diagnostic Console Interface.

8.4.27 Platform Trust Technology

Feature	Options	Description
fTPM	**Disable** Enable	Enable or disable Trusted Platform Module (TPM) support.

8.4.28 Security Configuration

Feature	Options	Description
TXE HMRFPO	Enable **Disable**	Enable or disable Host ME Region Flash Protection Overwrite (HMRFPO).
TXE Firmware Update	**Enabled** Disabled	Enable or disable firmware update.
TXE EOP Message	**Enabled** Disabled	Enable or disable TXE End of Post (EOP) Message.

8.4.29 Intel® RMT Configuration Submenu

Feature	Options	Description
Intel® RMT Support	**Disabled** Enabled	If this feature is enabled, the Intel® Ready Mode Technology (RMT) SSDT table will be loaded.
HW Notification	**Disabled** Enabled	Hardware notification enableing status.

8.4.30 PC Speaker Submenu

Feature	Options	Description
Debug Beeps	Disabled **Enabled**	Enable or disable general debug/status beep generation.
Input Device Debug Beeps	**Disabled** Enabled	Enable or disable input device debug beep generation.
Output Device Debug Beeps	**Disabled** Enabled	Enable or disable output device debug beep generation.
USB Driver Beeps	**Disabled** Enabled	Enable or disable USB driver beeps.

8.5 Chipset Setup

Select the 'Chipset' tab from the setup menu to enter the chipset setup screen.

Main	Advanced	Chipset	Boot	Security	Save & Exit
		Processor (Integrated Components)			
		Platform Controller Hub (PCH)			

8.5.1 Processor (Integrated Components) Submenu

Feature	Options	Description
▶Intel IGD Configuration	Submenu	
▶Graphics Power Management Control	Submenu	
▶Memory Configuration Options	Submenu	
Total Memory	No option	Displays the total amount of memory detected by the system

Memory Slot 0	No option	Displays the memory detected by the system on slot 0
Memory Slot 1	No option	Displays the memory detected by the system on Slot 1
Max TOLUD	**2 GB** 3 GB	Select maximum value of TOLUD.

8.5.1.1 Intel® IGD Configuration Submenu

Feature	Options	Description
Internal Graphics Device	**Enabled** Disabled	Enable or disable Internal Graphics Device (IGD).
IGD Turbo	**Auto** Enabled Disabled	Select the IGD turbo feature: 'Auto' - Enables IGD turbo only when SOC steeping is B0 or above.
GFX Boost	Enabled **Disabled**	Enable or disable GFX boost.
PAVC	Disabled **Enabled**	Enable or disable Protected Audio Video Control (PAVC).
PR3	Disabled **Enabled**	Enable or disable PR3. This is a feature for Win 10 only.
DVMT Pre-Allocated	**32M** 64M 96M 128M 160M 192M 224M 256M 288M 320M 352M 384M 416M 448M 480M 512M	Select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the IGD.
DVMT Total Gfx Mem	128MB **256MB** Max	Select DVMT 5.0 total graphic memory size used by the IGD.
Aperture Size	128MB **256MB** 512MB	Select the aperture size.

Feature	Options	Description
GTT Size	2MB **4MB** 8MB	Select the GTT size.
IGD Thermal	Enabled **Disabled**	Enable or disable IGD thermal.
Spread Spectrum clock	**Enabled** Disabled	Enable or disable spread spectrum clock.
WOPCMSZ	**1MB** 2MB 4MB 8MB	Set the size for WOPCMSZ.
ISP Enable/Disable	**Enabled** Disabled	Enable/Disable ISP PCI Device Selection.
ISP PCI Device Selection	**Disabled** ISP PCI Device as B0D2F0 ISP PCI Device as B0D3F0 ISP PCI Device as B0D3F0 with Virtual ISP B0D2F0	Default ISP is PCI B0D2F0 for window boot. Linux boot to select B0D3F0.
PUNIT Power Configuration	Disabled **Enabled**	Enable or disable PUNIT power configuration.
Svid Configuration	**Platform Defaults** Svid Config 0 Svid Config 1 Svid Config 3 Svid Config 4 BSW I2C PMIC Config	Select the right SVID configuration.

8.5.1.2 Graphics Power Management Control Submenu

Feature	Options	Description
RC6 (Render Standby)	**Enabled** Disabled	Enable or disable render standby support.
Power Meter Lock	**Enabled** Disabled	Enable or disable power meter lock.

8.5.1.3 Memory Configuration Options Submenu

Feature	Options	Description
Rank Margin Tool EV Mode	**Disabled** Enabled	Enable or disable rank margin tool print out message support.
DDR DVFS	Disabled **Enabled**	Enable or disable DDR dynamic voltage and frequency scaling in MRC.
Memory Frequency Override	**Disabled** Enabled	Enable to allow override of memory frequency parameters that are automatically obtained from DDR3 DIMM SPD. **Note:** May cause memory instability if the selected frequency is not supported by the memory device. This option has no effect on systems configured without 'UseDimmSpd' option.

Frequency A selection	Auto
	800
	1067
	1600
	800(SKU333)
	1000(SKU333)
	1333(SKU333)
	900(SKU360)
	1800(SKU360)
	933(SKU373)
	1866(SKU373)
		Select frequency A.

Frequency B selection	Auto
	1067
	800(SKU333)
	1000(SKU333)
	900(SKU360)
	933(SKU373)
		Select frequency B (minimum DDR DVFS frequency).

Auto Detect LPDDR3 DRAM	Disabled **Enabled**	Enable or disable automatic detection of LPDDR3 DRAM parameters.
LPDDR3 Chip Select	**1 Rank** 2 Ranks	Select LPDDR3 chip rank **Note:** 'Auto Detect LPDD3 DRAM' must be disabled to use this option.
Channel selection	Auto **Single** Dual	Select number of channels.
Channel Selection Bit 3:0	Default: **2** 0 - F	Set channel selection bit 3:0 (hexadecimal).
Channel Selection 4	Default: **1** 0 - F	BMISC Channel select 4 for channel hashing (hexadecimal).
Bank Address Hashing	Disabled **Enabled**	Enable or disable bank address hashing.

Feature	Options	Description
Rank Select Interleaving	Disabled **Enabled**	Enable or disable rank select interleaving.
Dynamic Self Refresh	Disabled **Enabled**	Enable or disable PUNIT driven DUNIT DDR dynamic self refresh.
DRAM PM5	Disabled **Enabled**	Enable or disable DRAM PM5 PUNIT configuration.
DDR3 2N Mode	**Disabled** Enabled	Enable to set the DDR3 mode to 2N. 1N mode is used by default.
RX Power Training	**Enabled** Disabled	Enable or disable RX Power Training.
TX Power Training	**Enabled** Disabled	Enable or disable TX Power Training.
MRC Fast Boot	**Enabled** Disabled	Enable or disable MRC fast boot. If disabled, forces MRC training.
Scrambler	**Enabled** Disabled	Enable or disable scrambler.
DRP Lock	Disabled **Enabled**	Enable or disable DRP lock.
REUT Lock	Disabled **Enabled**	Enable or disable REUT lock.
RH Prevention	**Disabled** Enabled	This feature prevents specific row hammer attacks. **Note:** If enabled, this function increases the average time between sending REF commands to DRAM.

8.5.2 Platform Controller Hub (PCH) Submenu

Feature	Options	Description
▶ Security Configuration	Submenu	Security Configuration Submenu.
▶ Azalia Configuration	Submenu	Azalia HD Audio Submenu.
▶ USB Configuration	Submenu	USB Submenu.
▶ PCI Express Configuration	Submenu	PCI Express Configuration Submenu.
Serial IRQ Mode	Quiet **Continuous**	Select IRQ Serial Mode.
Isolate SMBus Segments	**Never** During POST Always	Isolate the off-module/external SMBus segment from the on-module SMBus segment. This feature is a workaround for non spec conform external SMBus devices.

8.5.2.1 Security Configuration Submenu

Feature	Options	Description
RTC Lock	Disabled **Enabled**	Enable or disable bytes 38h-3Fh in the upper and lower 128-byte bank of RTC RAM lockdown.
BIOS Lock	**Enabled** Disabled	Enable or disable the BIOS Lock feature.
Global SMI Lock	**Enabled** Disabled	Enable or disable SMI lock.

8.5.2.2 Azalia Configuration Submenu

Feature	Options	Description
LPE Audio Support	**Disabled** PCI Mode ACPI Mode	Select LPE audio support.
Audio Controller	**Enabled** Disabled	Enable or disable audio controller.
Azalia Vci Enable	**Enabled** Disabled	Enable or disable Azalia Vci.
Azalia Docking Support Enable	Enabled **Disabled**	Enable or disable Azalia Docking support.
Azalia PME Enable	**Enabled** Disabled	Enable or disable Azalia PME support.
Azalia HDMI Codec	**Enabled** Disabled	Enable or disable Azalia HDMI codec.
HDMI Port B	**Enabled** Disabled	Enable or disable HDMI port B audio.
HDMI Port C	**Enabled** Disabled	Enable or disable HDMI port C audio.
HDMI Port D	**Enabled** Disabled	Enable or disable HDMI port D audio.

8.5.2.3 USB Configuration Submenu

Feature	Options	Description
xHCI Mode	**Enabled** Disabled	Mode of xHCI controller operation.
SSIC Support Enable	**Disabled** Enabled	Enable or disable SSIC support.
SSIC Init Sequence	**SSIC Initialization Sequence 1** SSIC Initialization Sequence 2	Select sequence 1 for Windows. Select sequence 2 for Android.
SSIC Port 1	Enabled **Disabled**	Enable or disable SSIC port 1.
SSIC Port 2	Enabled **Disabled**	Enable or disable SSIC port 2.
HSIC Port 1	**Enabled** Disabled	Enable or disable HSIC port 1.
HSIC Port 2	**Enabled** Disabled	Enable or disable HSIC port 2.
USB2 PHY Power Gating	**Auto** Disabled Enabled	Select USB2 PHY power gating.
USB3 PHY Power Gating	**Auto** Disabled Enabled	Select USB3 PHY power gating.
USB OTG Support	PCI Mode **Disabled**	Enable or disable USB OTG support.

8.5.2.4 PCI Express Configuration Submenu

Feature	Options	Description
▶ PCIE Express Root Port 1	Submenu	
▶ PCIE Express Root Port 2	Submenu	
▶ PCIE Express Root Port 3	Submenu	
▶ PCIE Express Root Port 4	Submenu	
▶ PCIE Express S0ix Settings	Submenu	
Native PCI Express Support	Disabled **Enabled**	Enable or disable native operating system PCIe support

8.5.2.4.1 PCIE Express Root Port 1,2,3 & 4

Feature	Options	Description
PCI Express Root Port 1	**Enabled** Disabled	Enable or disable the PCIe root port.
ASPM	**Auto** Disabled L0s L1 L0sL1	Select PCIe Active State Power Management (ASPM) setting.
URR	**Disabled** Enabled	Enable or disable PCIe Unsupported Request Reporting (URR).
FER	**Disabled** Enabled	Enable or disable PCIe device Fatal Error Reporting (FER).
NFER	**Disabled** Enabled	Enable or disable PCIe device Non-Fatal Error Reporting (NFER).
CER	**Disabled** Enabled	Enable or disable PCIe device Correctable Error Reporting (CER).
SEFE	**Disabled** Enabled	Enable or disable root PCIe System Error on Fatal Error (SEFE).
SENFE	**Disabled** Enabled	Enable or disable root PCIe System Error on Non-Fatal Error (SENFE).
SECE	**Disabled** Enabled	Enable or disable root PCIe System Error on Correctable Error (SECE).
PME SCI	Disabled **Enabled**	Enable or disable PCIe Power Management Event (PME) SCI.
Ext Sync	**Disabled** Enabled	Enable or disable express ext sync.
PCIe Speed	**Auto** Gen2 Gen1	Set PCIe speed. **Note:** Always use CHV A1 with Gen 1 speed.
Detect Non-compliant Device	**Disabled** Enabled	Enable this feature to detect some non-compliant PCIe devices. **Note:** POST takes more time if this feature is enabled.
L1 Substates	Disabled L1.1 L1.2 **L1.1 & L1.2**	Select PCIe L1 substates setting.
Non-Common Clock With SSC Enabled Mode	Enabled **Disabled**	Enable this feature if the root port is operating at non-common clock.

Feature	Options	Description
Transmitter Half Swing	Enabled **Disabled**	Enable or disable transmitter half swing.
Tx Eq Deemphasis Selection	3.5dB **6dB**	Select the level of de-emphasis for an upstream component.

8.5.2.4.2 PCIE Express S0ix Settings Submenu

Feature	Options	Description
D0 S0ix Policy	**PCIe RC shall be in D3** S0i1 is the deepest S0ix state PCIe RC in in D0 when entering S0ix Reserved	Select PCIe D0 S0ix policy.
Evaluate CLKREQ State	**Enabled** Disabled	Enable or disable evaluation of CLKREQ state.
CLKREQ# Enable	**CLKREQ# [0]** CLKREQ# [1] CLKREQ# [2] CLKREQ# [3]	Evaluate CLKREQ# [x] during PCIe in D0 S0ix entry and exit criteria checking.
S0ix LTR Threshold (Latency Scale)	1ns 32ns **1024ns** 32,768ns 1,048,576ns 33,554,321ns	Set PCIe S0ix LTR threshold for latency scale..
PCIe LTR Threshold (Latency Value)	**150**	Set the PCIe S0ix LTR threshold latency value. This value is multiplied by the latency scale.

8.6 Security Setup

Select the Security tab from the setup menu to enter the Security setup screen.

8.6.1 Security Settings

Feature	Options	Description
BIOS Password	No options	Set BIOS password.
BIOS Lock	**Enabled** Disabled	Enable or disable the BIOS lock feature

Feature	Options	Description
BIOS Update and Write Protection	**Disabled** Enabled	Enable or disable BIOS update
▶Secure Boot Menu	Submenu	Customizable secure boot settings.

8.6.1.1 Secure Boot Menu

Feature	Options	Description
System Mode	No options	Shows system mode.
Secure Boot	No options	Shows secure boot status.
Vendor Keys	No options	Shows vendor keys status.
Secure Boot	**Disabled** Enabled	Secure boot can be enabled if the system is running in user mode with enrolled Platform Key (PK) and when CSM function is disabled.
Secure Boot Mode	Standard **Custom**	Select secure boot mode.
▶Key Management	Submenu	

8.6.1.1.1 Key Management Submenu

Feature	Options	Description
Provision Factory Default Keys	**Disabled** Enabled	Enable this feature to install factory default secure boot keys when system is in setup mode.
▶Enroll all Factory Default Keys		Force system to user mode and install all factory default keys.
▶Platform Key(PK)		
▶Key Exchange Keys		
▶Authorized Signatures		
▶Forbidden Signatures		
▶Authorized TimeStamps		

8.7 Boot Setup

Select the Boot tab from the setup menu to enter the Boot setup screen.

8.7.1 Boot Settings Configuration

Feature	Options	Description
Setup Prompt Timeout	Default: **1** 0 - 65535	Set number of seconds to wait for setup activation key. '65535' - Waits indefinetly (0xFFFF). '0' - Does not wait (not recommended).
Bootup NumLock State	**On** Off	Set the keyboard numlock state.
Quiet Boot	**Disabled** Enabled	'Disabled' - Displays normal POST diagnostic messages. 'Enabled' - Displays OEM logo instead of POST messages. **Note:** The default OEM logo is a dark screen.
Enter Setup If No Boot Device	No **Yes**	Select whether the setup menu should be started if no boot device is connected.
Enable Popup Boot Menu	No **Yes**	Select whether the popup boot menu can be started.
Boot Priority Selection	Device Based **Type Based**	Set boot priority: 'Device Based' - Set boot priority from a list of currently detected devices. 'Type Based' - Set boot priority from a list of device types even if they are not connected yet.
Boot Option Sorting Method	**Legacy First** UEFI First	Set boot option sorting method: 'Legacy First' - Tries all legacy boot option first before first UEFI boot option. 'UEFI First' - Tries all UEFI boot options before first legacy boot option.
Power Loss Control	**Remain Off** Turn On Last State	Select the mode of operation if an AC power loss occurs: 'Remain Off' - Keeps the power off until the power button is pressed. 'Turn On' - Restores power to the computer. 'Last State' - Restores the previous power state before power loss occurred. **Note:** Please chose an ATX type power supply if you want to use this feature.
AT Shutdown Mode	System Reboot **Hot S5**	Select the behavior of an AT-powered system after a shutdown.
System Off Mode	**G3/Mech Off** S5/Soft Off	Select the system state after a shutdown if a battery system is connected.
Fast Boot	**Disabled** Enabled	Enable this feature to boot with a minimum set of devices. **Note:** This feature has no effect on BBS / legacy boot options.

Feature	Options	Description
1st Boot Device	Disabled SATA 0 Drive SATA 1 Drive NVMe Storage USB Harddisk **USB CDROM** Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	
2nd Boot Device	Disabled SATA 0 Drive SATA 1 Drive NVMe Storage **USB Harddisk** USB CDROM Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	
3rd Boot Device	Disabled **SATA 0 Drive** SATA 1 Drive NVMe Storage USB Harddisk USB CDROM Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	

Feature	Options	Description
4th Boot Device	Disabled SATA 0 Drive **SATA 1 Drive** NVMe Storage USB Harddisk USB CDROM Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	
5th Boot Device	Disabled SATA 0 Drive SATA 1 Drive NVMe Storage USB Harddisk USB CDROM **Other USB Device** Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	
6th Boot Device	Disabled SATA 0 Drive SATA 1 Drive **NVMe Storage** USB Harddisk USB CDROM Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	

Feature	Options	Description
7th Boot Device	Disabled SATA 0 Drive SATA 1 Drive NVMe Storage USB Harddisk USB CDROM Other USB Device Onboard eMMC Storage **Onboard LAN** External LAN Firmware-based Bootloader Other Device	
8th Boot Device	Disabled SATA 0 Drive SATA 1 Drive NVMe Storage USB Harddisk USB CDROM Other USB Device Onboard eMMC Storage Onboard LAN External LAN Firmware-based Bootloader **Other Device**	
Battery Support	**Auto (Battery Manager)** Battery-Only On I2C Bus Battery-Only On SMBus	Battery system support selection. Select 'Battery-Only On I2C Bus' for battery-only systems using I2C bus and 'Battery-Only On SMBus' for battery-only systems using SMBus. Select 'Auto' for systems equipped with a real battery system manager (connected via I2C or SMBus). Auto (Battery Manager).
UEFI Screenshot Capability	**Disabled** Enabled	If Enabled, you can press LCrtl+LAlt+F12 to take screenshot from current screen. It will be saved as PNG image on the first writable FAT32 partition found.
New Boot Option Policy	**Default** Place First Place Last	Controls the placement of newly detected UEFI boot options.

Note

The term ‘AC power loss’ stands for the state when the module looses the standby voltage on the 5V_SB pins. On congatec modules, the standby voltage is continuously monitored after the system is turned off. If within 30 seconds the standby voltage is no longer detected, then this is considered an AC power loss condition. If the standby voltage remains stable for 30 seconds, then it is assumed that the system was switched off properly.

Inexpensive ATX power supplies often have problems with short AC power sags. When using these ATX power supplies it is possible that the system turns off but does not switch back on, even when the PS_ON# signal is asserted correctly by the module. In this case, the internal circuitry of the ATX power supply has become confused. Usually another AC power off/on cycle is necessary to recover from this situation.

8.8 Save & Exit Menu

Select the Save & Exit tab from the setup menu to enter the Save & Exit setup screen. You can display a Save & Exit screen option by highlighting it using the <Arrow> keys.

Feature	Description
Save Options	
Save Changes and Exit	Exit setup menu after saving the changes. The system is only reset if settings have been changed.
Discard Changes and Exit	Exit setup menu without saving any changes.
Save Changes and Reset	Save changes and reset the system.
Discard Changes and Reset	Reset the system without saving any changes.
Save Options	
Save Changes	Save changes made so far to any of the setup options. Stay in setup menu.
Discard Changes	Discard changes made so far to any of the setup options. Stay in setup menu.
Default Option	
Restore Defaults	Restore default values for all the setup options.
Save as User Default	Save the changes done so far as User Defaults.
Restore as User Default	Restore the User Defaults to all the setup options.
Boot Override	
List of all boot devices currently detected	Select device to leave setup menu and boot from the selected device. Only visible and active if Boot Priority Selection setup node is set to “Device Based”.
Generate Menu Layout File	Menu layout file will be generated and stored on the first writable file system found.

9 Additional BIOS Features

9.1 Navigating the BIOS Setup Menu

The BIOS setup menu shows the features and options supported in the congatec BIOS. To access and navigate the BIOS setup menu, press the <DEL> or <F2> key during POST.

The right frame displays the key legend. Above the key legend is an area reserved for text messages. These text messages explain the options and the possible impacts when changing the selected option in the left frame.

9.2 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-IA4 is identified as IA40R1xx where:

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

The IA40 BIOS binary size is 8 MB.

9.3 Updating the BIOS

OEMs often use BIOS updates to correct platform issues discovered after the board has been shipped or when new features are added to the BIOS. The conga-IA4 uses a congatec/AMI AptioEFI firmware, which is stored in an onboard flash ROM chip and can be updated using the congatec System Utility. The utility has five versions—UEFI shell, DOS based command line, Win32 command line, Win32 GUI, and Linux version.

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

9.4 Supported Flash Devices

The conga-IA4 supports the following flash devices:

- Winbond W25Q64JVSSIG (8MB)

Note

The flash device listed above has been tested and can be used on the congatec debug adapter (PN:047858) listed in table 5 "Adapters". 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.

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