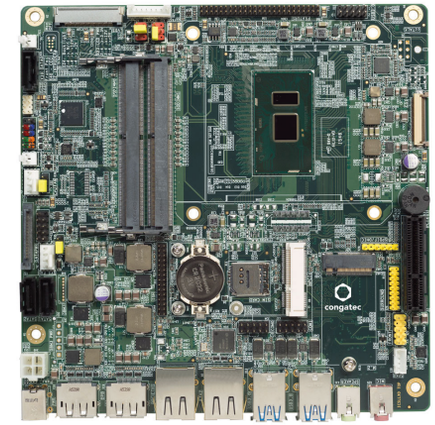

conga-IC170 Thin Mini-ITX SBC

Detailed Description Of The congatec Thin Mini-ITX Based On Intel 6th Generation U-Series SoC

User's Guide

Revision 0.1 (Preliminary)

Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
0.1	2016.08.19	AEM	• Preliminary release

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Preface

This user's guide provides information about the components, features and connectors available on the conga-IC170 Thin Mini-ITX single board.

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

Warning

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

Caution

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

Note

Notes call attention to important information that should be observed.

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
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

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1 Introduction

1.1 Mini-ITX Concept

The Mini-ITX form factor provides enthusiasts and manufacturers with a standardized ultra compact platform for development. With a footprint of 170mm x170mm, this scalable platform promotes the design of highly integrated, energy efficient systems. Due to its small size, the Mini-ITX form factor enables PC appliance designers not only to design attractive low cost devices but also allows them to explore a huge variety of product development options - from compact space-saving designs to fully functional Information Station and Value PC systems. This helps to reduce product design cycle and encourages rapid innovation in system design, to meet the ever-changing needs of the market.

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

1.2 conga-IC170

The conga-IC170 is a Single Board Computer designed based on the Thin Mini-ITX specification. The conga-IC170 SBC features the 6th Generation Intel Core U-Series processors. With 15W base TDP, the SBC offers Ultra Low Power boards with high computing performance and outstanding graphics. Additionally, the SBC supports dual channel DDR4 up to 2133 MT/s for a maximum system memory capacity of 32 GB, multiple I/O interfaces, up to three independent displays and various congatec embedded features.

With smaller board size and lower height keep-out zones, the conga-IC170 SBC provides manufacturers and system designers with the opportunity to design compact systems for space restricted areas. With appropriate I/O shield, the same conga-IC170 SBC can be used in either a Thin Mini-ITX or a Mini-ITX design.

The various features and capabilities offered by the conga-IC170 makes it ideal for the design of compact, energy efficient, performance-oriented embedded systems.

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1.2.1 Options Information

The conga-IC170 is currently available in four variants. This user's guide describes all of these variants. The table below show the different configurations available. Check for the part number that applies to your product. This will tell you what options described in this user's guide are available on your particular module

Table 1 conga-IC170 Variants

Part-No.	052700	052701	052702	052703
Processor	Intel® Core™ i5-6300U 2.4 GHz Dual Core™	Intel® Core™ i3-6100U 2.3 GHz Dual Core™	Intel® Celeron™ 3955U 2.0 GHz Dual Core™	Intel® Core™ i7-6600U 2.6 GHz Dual Core™
Intel® Smart Cache	3 MByte	3 MByte	2 MByte	4 MByte
Max. Turbo Frequency	3 GHz	N.A	N.A	3.4 GHz
Processor Graphics	Intel® HD Graphics 520 (GT2)	Intel® HD Graphics 520 (GT2)	Intel® HD graphics 510 (GT1)	Intel® HD Graphics 520 (GT2)
Graphics Max. Dynamic Freq	1.0 GHz	1.0 GHz	900 MHz	1.0 GHz
Memory (DDR4)	2133 MT/s dual channel	2133 MT/s dual channel	2133 MT/s dual channel	2133 MT/s dual channel
LVDS	Yes	Yes	Yes	Yes
DisplayPort (DP)	Yes	Yes	Yes	Yes
HDMI	Via DP to HDMI cable adapter	Via DP to HDMI cable adapter	Via DP to HDMI cable adapter	Via DP to HDMI cable adapter
Processor TDP (cTDP down)	15 (7.5) W	15 (7.5) W	15 (10) W	15 (7.5) W

1.2.2 Optional Accessories

Table 2 Cooling/IO Shield

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

Table 3 Memory Modules

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

Table 4 Cables

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Cables	Part No.	Description
cab-ThinMini-ITX-SATA-Power	14000120	Power cable for SATA and micro-SATA devices.
cab-ThinMini-ITX-UART	14000121	UART cable with 2x5-pin female housing and D-Sub male connector.
cab-ThinMini-ITX-USB2.0-Single	14000122	USB 2.0 cable with 1x5-pin female housing and USB 2.0 Type A female connector.
cab-ThinMini-ITX-USB2.0-Twin	14000123	USB 2.0 cable with twin USB 2.0 Type A female connector and 2x5-pin housing.
cab-ThinMini-ITX-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-ThinMini-ITX-SATA-Power (50cm lenght)	14000135	50cm SATA power cable with 2x15-pin female connectors.
cab-ThinMini-ITX-SATA-Power (30cm length)	14000136	30cm SATA power cable with 2x15-pin female connectors.
SATA III cable (straight/straight)	48000029	30cm SATA III data cable with straight connectors at both ends
SATA III cable (straight/right-angled)	48000030	30cm SATA III data cable with straight/right-angled connectors

Table 5 Adapters

Adapters	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 and other useful IO's

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2 Specification

2.1 Feature List

Table 6 Feature Summary

Form Factor	Based on Thin Mini-ITX form factor (170 x 170 mm).	
Processor	6th Generation Intel® Core™ i7,i5, i3, Celeron Single Chip Ultra Low TDP Processors.	
Memory	Two memory sockets (located on the top side of the conga-TC97). Supports - SO-DIMM non-ECC DDR4 (voltage @ 1.2V) modules - Data rates up to 2133 MT/s - Maximum 32 GB capacity (16 GB per channel)	
cBC	Multi-stage watchdog, non-volatile user data storage, manufacturing and board information, board statistics, hardware monitoring, fan control, I2C bus, Power loss control.	
Chipset	Intel® 100 Series PCH-LP integrated in the Multi-Chip Package.	
Audio	Realthek ALC888S-VD 7.1 channel High Definition Audio codec	
Ethernet	2x Gigabit Ethernet support via the onboard Intel® I219LM GbE PHY (with AMT 11 support) and Intel® I211 GbE controller.	
Graphics	Next Generation Intel® HD Graphics (510/520) with support for Intel® Clear Video Technology (HD encode/transcode, Blu-ray playback), DirectX Video Acceleration (full AVC/VC1/MPEG2 hardware decode), OpenGL 4.4, and DirectX12. Up to 3 independent displays supported (**Must be two DDI's (DP, HDMI/DVI) plus one LVDS/eDP**)	
Graphic Interfaces	2x DP++ and 1x LVDS/eDP	
Back Panel I/O Connectors	2x DisplayPort++ (DP, HDMI,DVI) 1x Mic IN 1x Line OUT	2x Gigabit Ethernet (only connector X5 supports AMT) 4x USB 3.0 (supports also USB 2.0 devices) 1x DC-IN
Onboard I/O Connectors	1x LVDS (top side) 1x Backlight 1x Monitor OFF 1x eDP interface (bottom side) 1x MIPI-CSI (camera interface) 1x Integrated Sensor Hub (ISH) header 1x Micro SIM card slot 1x Micro SD card slot (bottom side) SATA Interfaces: - 2x Standard SATA 3.0 - 1x M.2 SATA SSD slot - 1x SATA power header connector (3.3V, 5V or 12V) PCI Express Interfaces: - 1x PCIe x4 slot (gen. 3) - 1x M.2 PCIe x1 slot (requires customized BIOS) - 1x Full/half size mini PCIe 4x USB 2.0	1x Internal power connector (12-24V) 1x Surround 1x Front Panel HD Audio 1x Digital microphone 1x Stereo speaker Super IO - 2x COM ports (COM 2 can be used optionally as ccTALK) - 1x CPU Fan with selectable voltage - 1x System Fan with selectable voltage - GPOs on feature connector Feature Connector (GPIOs, SPI, SMB, LPC, LID/SLEEP etc) 1x Front panel header (power button, reset, LEDs) 1x Intrusion detection header (case open) Optional Interfaces: - 1x SBM³ support header - 1x SBM³ power - 1x CEC header

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Other Features	Thermal and voltage monitoring CMOS Battery Beeper congatec standard BIOS (also possible to boot from an external BIOS by triggering the BIOS_DISABLE# signal on the feature connector)
BIOS	AMI Aptio® UEFI 5.x firmware, 8/16 MByte serial SPI with congatec Embedded BIOS features.
Power Management	ACPI 4.0 compliant with battery support. Also supports Suspend to RAM (S3) and Intel AMT 9.5/10. Configurable TDP Ultra low standby power consumption, Deep Sx.
Security	Optional discrete TPM 1.2/2.0; new AES Instructions for faster and better encryption.

Note

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

2.2 Supported Operating Systems

The conga-IC170 supports the following operating systems.

- Microsoft® Windows® 10
- Microsoft® Windows® 8.1
- Microsoft® Windows® 7
- Microsoft® Windows® Embedded Standard 7/8
- Linux 3.x/4.x

Note

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

2.3 Mechanical Dimensions

- 170mm x 170mm
- Height approximately 20mm

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2.4 Supply Voltage Power

- 12-24V DC ± 5%

2.5 Power Consumption

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

- conga-IC170 SBC
- conga-IC170 cooling solution
- Microsoft Windows Operating System

Note

All peripherals were powered externally and therefore did not influence the measured values.

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

Table 7 Power States

System State	Description
S0: Minimum value	Sets the SBC to lowest frequency mode (LFM) with minimum core voltage during desktop idle. In this state, the CPU is stressed to its maximum frequency.
S0: Maximum value	Sets the SBC to highest frequency mode (HFM/Turbo Boost). In this state, the CPU is stressed to its maximum frequency.
S0: Peak value	The worst case power consumption value shows the peak value over a short period of time - highest power spike during the measurement of "S0: Maximum value". Consider this value when designing the system's power supply to ensure that the power supply is sufficient during worst case scenarios.
S3	SBC is powered by 12V.
S5	SBC is powered by 12V.

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Processor Information

The tables below provide additional information about the power consumption data for each of the conga-IC170 variants offered. The values are recorded at various operating modes.

Table 8 Intel Core i5-6300U

Part No. 052700 (GT2 Graphics)	Intel® Core™ i5-6300U Dual Core 2.6 GHz 3MB L2 Cache (14nm) Hardware Rev. x.x / BIOS Rev. TCSLxxx				
Max. Turbo Frequency	3 GHz				
Memory Size	2x2 GB				
Operating System	Windows 7 (64 bit)				
Power State	Desktop Idle	100% CPU Workload [W]	100% CPU & 100% GPU Workload [W]	Max. Power Consumption (Worst Case)	Suspend to Ram (S3) 5V SB Input
Power consumption (Amps./Watts)	TBD	TBD	TBD	TBD	TBD

Table 9 Intel Core i3-6100U

Part No. 052701 (GT2 Graphics)	Intel® Core™ i3-6100U Dual Core 2.3 GHz 3MB L2 Cache (14nm) Hardware Rev. x.x / BIOS Rev. TCSLxxx				
Max. Turbo Frequency	N.A				
Memory Size	2x2 GB				
Operating System	Windows 7 (64 bit)				
Power State	Desktop Idle	100% CPU Workload [W]	100% CPU & 100% GPU Workload [W]	Max. Power Consumption (Worst Case)	Suspend to Ram (S3) 5V SB Input
Power consumption (Amps./Watts)	TBD	TBD	TBD	TBD	TBD

Table 10 Intel Celeron 3955U

Part No. 052702 (GT1 Graphics)	Intel® Celeron™ 3955U Dual Core 2.0 GHz 2MB L2 Cache (14nm) Hardware Rev. x.x / BIOS Rev. TCSLxxx				
Max. Turbo Frequency	N.A				
Memory Size	2x2 GB				
Operating System	Windows 7 (64 bit)				
Power State	Desktop Idle	100% CPU Workload [W]	100% CPU & 100% GPU Workload [W]	Max. Power Consumption (Worst Case)	Suspend to Ram (S3) 5V SB Input
Power consumption (Amps./Watts)	TBD	TBD	TBD	TBD	TBD

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Table 11 Intel Core i7-6600U

Part No. 052703 (GT2 Graphics)	Intel® Core™ i7-6600U Dual Core 2.6 GHz 4MB L2 Cache (14nm) Hardware Rev. x.x / BIOS Rev. TCSLxxx				
Max. Turbo Frequency	3.4 GHz				
Memory Size	2x2 GB				
Operating System	Windows 7 (64 bit)				
Power State	Desktop Idle	100% CPU Workload [W]	100% CPU & 100% GPU Workload [W]	Max. Power Consumption (Worst Case)	Suspend to Ram (S3) 5V SB Input
Power consumption (Amps./Watts)	TBD	TBD	TBD	TBD	TBD

2.6 Supply Voltage Battery Power

- Typical 3V DC

2.6.1 CMOS Battery Power Consumption

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

Do not use the CMOS battery power consumption values listed above to calculate CMOS battery lifetime. You should measure the CMOS battery power consumption in your customer specific application in worst case conditions (for example, during high temperature and high battery voltage). The self-discharge of the battery must also be considered when determining CMOS battery lifetime. For more information about calculating CMOS battery lifetime refer to application note AN9_RTC_Battery_Lifetime.pdf on congatec AG website at www.congatec.com.

2.7 Environmental Specifications

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

Note

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

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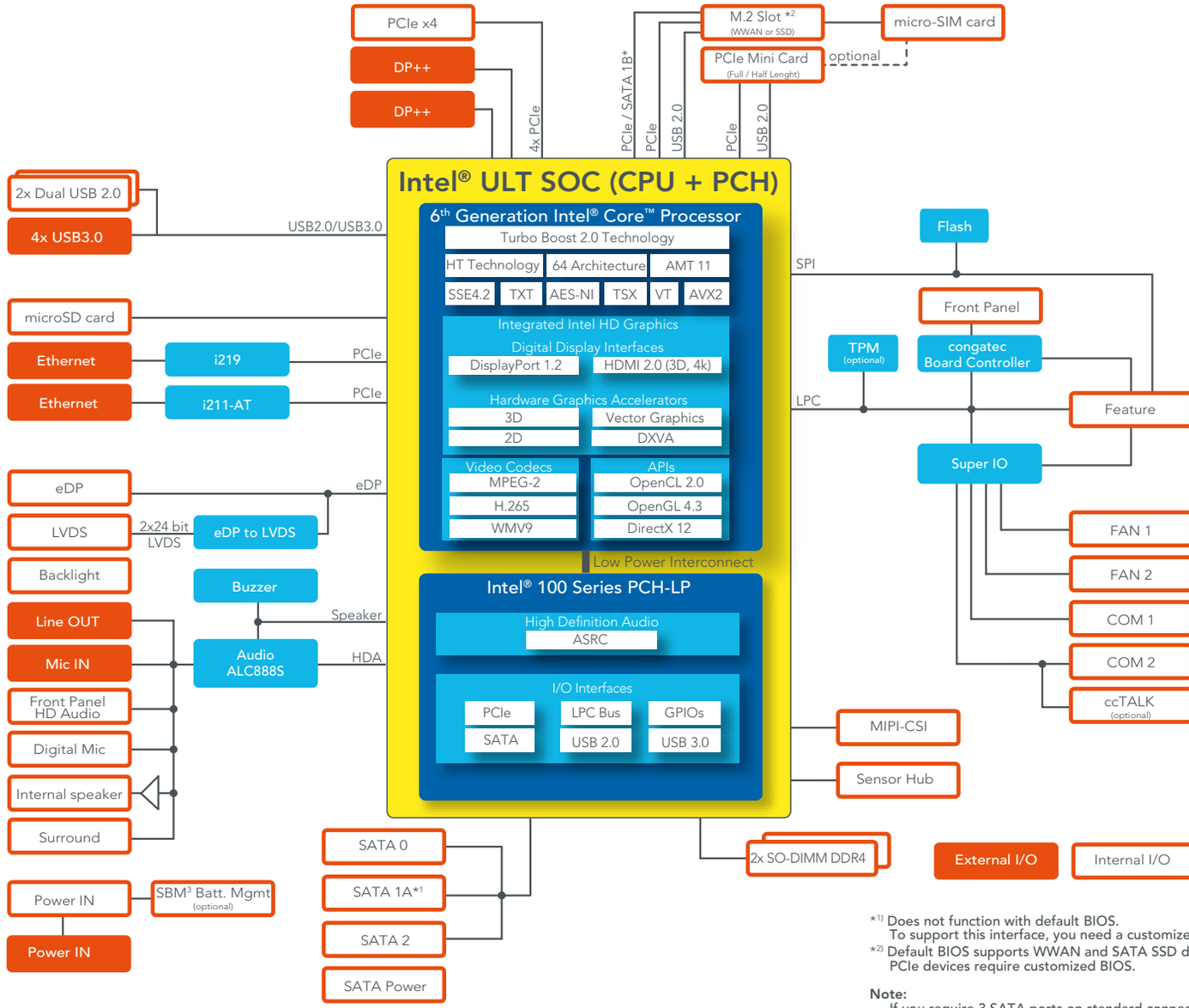
3 Block Diagram



*1) Does not function with default BIOS.
To support this interface, you need a customized BIOS.

*2) Default BIOS supports WWAN and SATA SSD devices only.
PCIe devices require customized BIOS.

Note:
If you require 3 SATA ports on standard connector, you need a customized BIOS. With this option, M.2 slot does not support SATA SSD.

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4 Cooling Solution

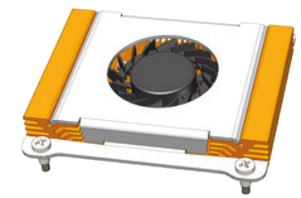
The conga-IC170 SBC offers Ultra Low Power boards with high computing performance and outstanding graphics. Due to its low power consumption, the SBC generates less heat and therefore requires less active cooling, allowing the use of quieter, lower profile coolers that are better suited to small form factor systems.

Nonetheless, all electronics contain semiconductor devices which have operating temperature ranges that should be adhered to. For this reason, it is imperative to provide sufficient air flow to each of the components, to ensure the specified operating temperature of the conga-IC170 is maintained.

congatec AG offers two cooling possibilities for the conga-IC170:

- A customized active cooling solution (fan attached with heatsink) in combination with the conga-IC170 retention frame. This cooling solution is adapted to the Thin Mini-ITX height specification and features a Hi-Flow 225UT pressure sensitive, phase change thermal interface. The retention frame acts as a mounting backplate and also as board reinforcement to prevent PCB deformation. Refer to section 4.2 "Active Cooling Dimensions" for the dimensions of the active cooling solution.
- The use of a custom cooling solution in combination with the conga-IC170 retention frame.

Retention Frame



Active Cooling Solution

Note

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

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

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4.1 Cooling Installation

Assembly Instruction:

- Flip over the SBC and locate the position of the CPU
- Place retention frame on the bottom side of the board with insulating foil facing the PCB & standoffs inserted to mounting holes in PCB.
- Remove the protection pull tab foil from the phase changer and carefully place the cooling solution.
- Insert assembling screws.
- Slightly tighten each of the screws so that they hold the cooling solution in place. To do so, start with one screw and then slightly tighten the other screws in a crossover pattern.
- Now you can fully tighten the screws. Once again start with one and then continue to tighten the other screws in a crossover pattern.
- Connect the fan's power cable.

Caution

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

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

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

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

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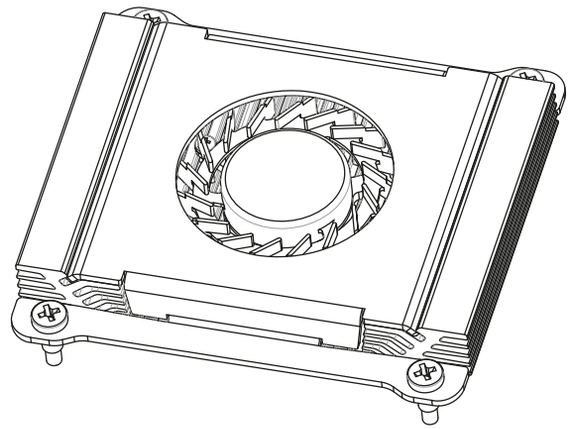
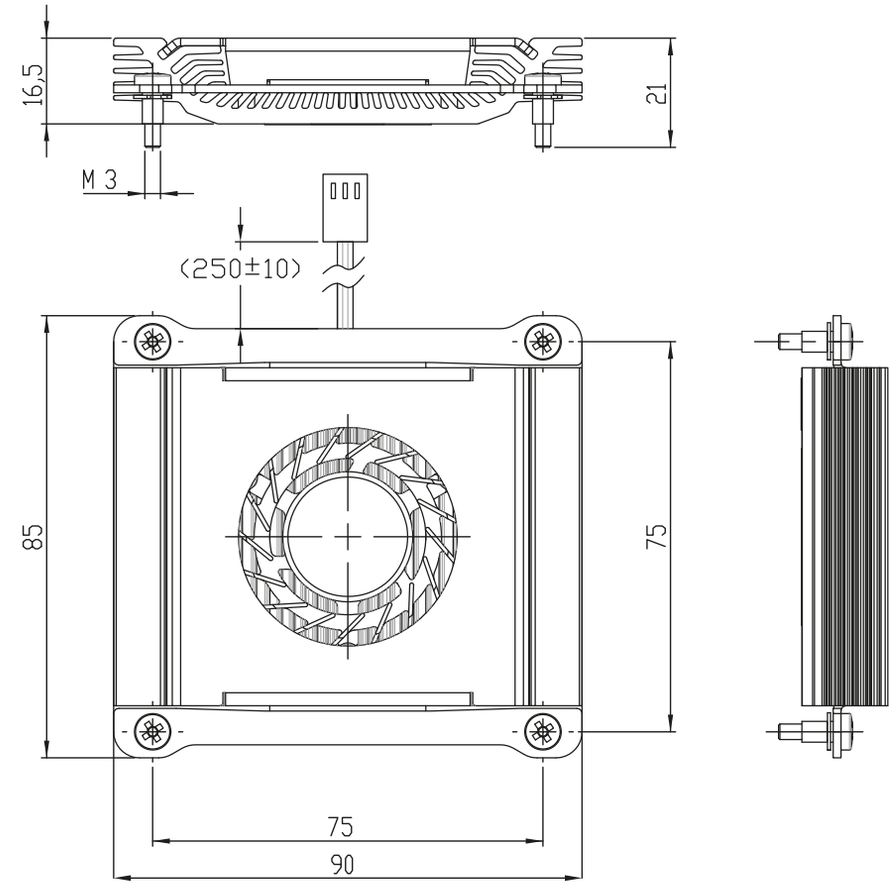
4.2 Active Cooling Dimensions





Note

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

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

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5 Connector Description

5.1 Power Supply

You can power the conga-IC170 SBC with a 12V-24V laptop type DC power supply (on connector X48) or a 4-pin internal power supply (on connector X49).

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

Note

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

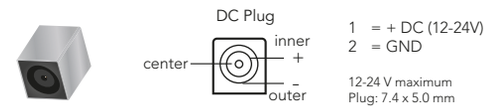
5.1.1 DC Power Jack (Rear I/O)

You can power the conga-IC170 SBC with a laptop-type DC power supply, connected to the DC power jack on the back panel. The power input protects against polarity reversal and under/over voltage.

Table 12 Connector X48 Pinout Description

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

DC Power Jack - Connector X48



Connector Type

X48 : DC power jack, 7.4x5.1mm diameter

Note

The conga-IC170 turns on immediately you connect a power supply. To change this behavior, set the "Power Loss Control" in the BIOS Boot Settings Configuration menu to "Remain OFF".

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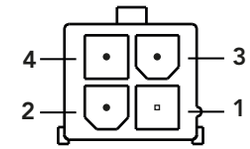
5.1.2 Power Supply (Internal Connector)

The conga-IC170 offers an internal 4-pin power connector. This connector makes it possible to use customized power supply cables or connectors. The power input protects against under voltage or over voltage.

Table 13 Connector X49 Pinout Description

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 X49



Connector Type

X49 : 2x2-pin, 4.2mm pitch connector

Mating connector: Molex 87427-0442

Note

The conga-IC170 turns on immediately you connect a power supply. To change this behavior, set the "Power Loss Control" in the BIOS Boot Settings Configuration menu to "Remain OFF".

5.1.3 Optional SBM³ Power Connector (Internal Connector)

You can also power the conga-IC170 SBC optionally (BOM option) with an SBM battery kit. This option requires:

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

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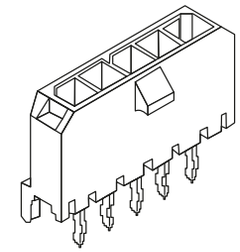
Table 14 Connector X47 Pinout Description

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

SBM3 Power - Connector X47



Connector Type

X47 : 1x5-pin, 3mm pitch Molex Micro-FIT connector

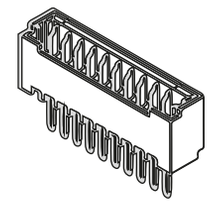
5.1.3.1 Optional SBM3 Signal Connector

As mentioned in section 5.1.3, you need the optional power connector X47 and the signal connector X47 for designs with SBM battery kit. The signal connector ensures the conga-IC170 communicates flawlessly with the battery kit.

Table 15 Connector X46 Pinout Description

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

SBM3 Signal - Connector X46



Connector Type

X46 : 8-pin, 1.25mm pitch Molex PicoBlade connector

5.1.4 Power Status LEDs

The conga-IC170 provides two LED signals (FP_LED+ and P_LED-) on pins 2 and 4 of the front panel connector X39. The signals indicate the different power states of the conga-IC170.

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Table 16 LED States

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

Note

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

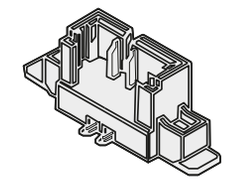
5.2 CMOS Battery/RTC

The conga-IC170 provides a board-mounted battery holder (M60) for CMOS battery. The CMOS battery supplies the necessary power required to maintain the CMOS settings and configuration data in the UEFI flash chip. The specified battery type is CR2032

The conga-IC170 offers an optional connector (X44) for external CMOS battery. .

M60 (Battery Holder)

Optional connector X44



Connector Type

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

Warning

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

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5.3 Audio Interface

The conga-IC170 provides audio connectors internally and on the rear side. The internal audio connectors are stereo speaker, digital microphone/ SPDIF and front Panel HD audio. The rear audio connectors are Line-OUT and Mic-IN.

5.3.1 Rear Audio Connectors

The conga-IC170 has a high definition audio codec (Realtek ALC888S) mounted on it. The line output signals and the MIC signals are routed to connectors X31 (line-OUT) and X29 (MIC-IN) on the rear side respectively. You can find the drivers for this codec in the 'Drivers' section, under 'conga-IC170' at www.congatec.com.

Table 17 MIC-IN (Connector X29) Pinout Description

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

MIC IN - Connector X29

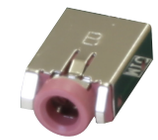
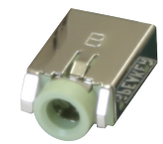


Table 18 Line-OUT (Connector X31) Pinout Description

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 X31



Connector Type

X29, X31: 6-pin, single audio jack

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5.3.2 Internal Audio Connectors

The conga-IC170 provides the stereo speaker, digital microphone/SPDIF, front panel HD and surround audio connectors internally.

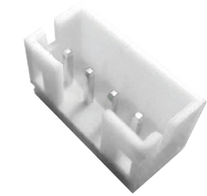
5.3.2.1 Stereo Speaker Header

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

Table 19 Stereo Speaker (Connector X30) Pinout Description

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

Stereo Speaker - Connector X30



Connector Type

X30: 2mm, 4-pin crimp style connector

Mating connector: Chyao Shiunn JS-1124-04

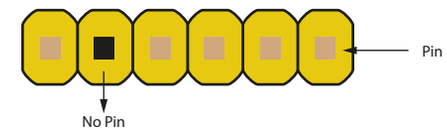
5.3.2.2 Digital Microphone/SPDIF

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

Internal Digital Microphone/SPDIF (Connector X28) Pinout Description

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

Digital MIC/SPDIF - Connector X28



Connector Type

X28: 2.54mm, 1x6-pin header

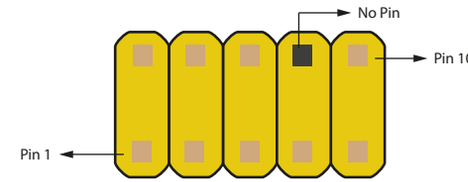
5.3.2.3 Front Panel HD Audio

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

Table 20 Front Panel HD Audio (Connector X27) Pinout Description

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

Front Panel Audio - Connector X27



Connector Type

X27: 2.54mm, 2x5-pin header

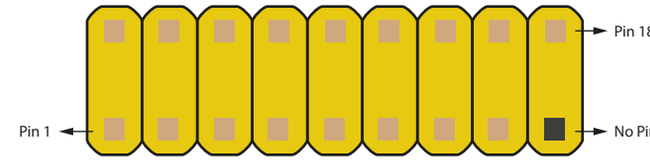
5.3.2.4 Surround header

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

Table 21 Surround (Connector X26) Pinout Description

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

Surround - Connector X26



Connector Type

X26: 2mm, 2x9-pin header

5.4 Communication Bus

The conga-IC170 supports both SMBus and I2C compliant devices.

5.4.1 SMBus

The SMBus signals are available in different locations on the conga-IC170, including the feature connector (X38) 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-IC170, including the feature connector (X38) described in section 6.13 of this document.

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5.4.3 SPI Bus

The SPI signals are connected to the onboard SPI flash and the feature connector (X38). With the SPI signals on the feature connector, you can start the conga-IC170 from an external flash. This however requires a customized adapter to trigger the BIOS_DISABLE# signal (pin 46) of the feature connector.

Note

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

5.5 LPC Super I/O Device

The conga-IC170 has an onboard Super I/O controller. The controller is connected to the SoC's LPC bus and provides additional interfaces such as two serial interfaces, optional ccTALK, GPOs, 4-wire CPU and system fans. .

5.5.1 GPIOs

The conga-IC170 SBC provides eight General Purpose Inputs via the congatec board controller and eight General Purpose Outputs via the onboard Super I/O. The GPIO signals are routed to the feature connector (X38) described in section 6.13 "Feature Connector".

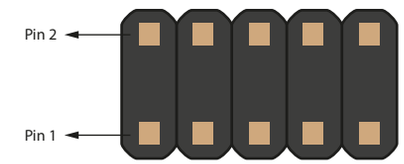
5.5.2 Serial Ports (COM)

The Super I/O controller on the conga-IC170 provides two fully featured RS-232 compliant UART interfaces (COM 1 and 2). The COM ports support data rates up to 250 kbps with worst-case loads of 3kΩ, in parallel with 1nF.

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

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

COM 1 & 2 - Connectors X34/X37



Connector Type

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

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Note

The conga-IC170 offers an optional ccTALK interface. This interface uses transmit and receive signals of COM 2. If this option is implemented, COM 2 will not be available.

Note

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

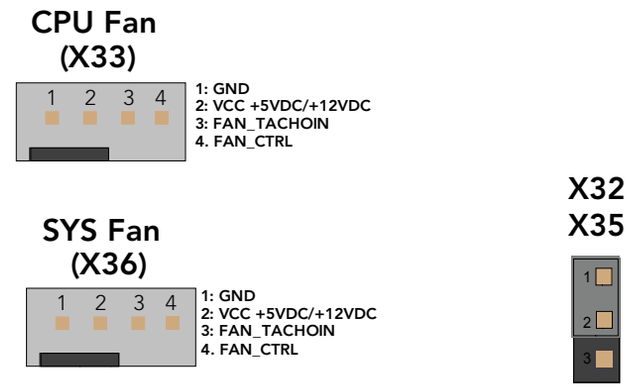
5.5.3 CPU/System Fan Connector & Power Configuration

The conga-IC170 supports 5V or 12V CPU and system fans. The signals of the CPU and system fans are routed to connectors X33 and X36 respectively. Use jumper X32 to select the voltage of the CPU fan and jumper X35 to select the voltage of the system fan.

Table 23 CPU/SYS Fan Pinout

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

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



Connector Type

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

X32, X35: 2.54mm grid jumper

Note

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

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5.6 Universal Serial Bus (USB)

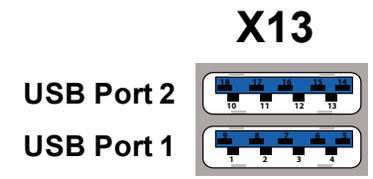
The conga-IC170 provides 10 USB ports - four ports on the rear connectors, four ports internally and two ports on the mini-PCIe and M.2 connectors.

5.6.1 Rear USB Connectors

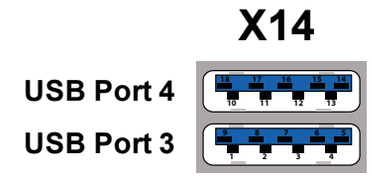
The conga-IC170 offers four USB 3.0 ports (port 1-4) on the rear side. These ports are routed directly from the SoC to connectors X13 and X14. The ports support also USB 2.0 devices.

Table 24 USB 3.0 (Connectors X13 and X14) Pinout Descriptions

USB Port 1 - Connector X13 (Lower)			USB Port 2 - Connector X13 (Upper)		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V power	10	+5V	+5V power
2	USB1-	Differential USB 2.0 data signals (port 0)	11	USB2-	Differential USB 2.0 data signals (port 1)
3	USB1+		12	USB2+	
4	GND	Ground	13	GND	Ground
5	USB3.0_SS1_RX-	Differential SuperSpeed receiver signals (port 0)	14	USB3.0_SS2_RX-	Differential SuperSpeed receiver signals (port 1)
6	USB3.0_SS1_RX+		15	USB3.0_SS2_RX+	
7	GND	Ground	16	GND	Ground
8	USB3.0_SS1_TX-	Differential SuperSpeed transmitter signals (port 0)	17	USB3.0_SS2_TX-	Differential SuperSpeed transmitter signals (port 1)
9	USB3.0_SS1_TX+		18	USB3.0_SS2_TX+	



USB Port 3 - Connector X14 (Lower)			USB Port 4 - Connector X14 (Upper)		
Pin	Signal	Description	Pin	Signal	Description
1	+5V	+5V power	10	+5V	+5V power
2	USB3-	Differential USB 2.0 data signals (port 2)	11	USB4-	Differential USB 2.0 data signals (port 3)
3	USB3+		12	USB4+	
4	GND	Ground	13	GND	Ground
5	USB3.0_SS3_RX-	Differential SuperSpeed receiver signals (port 2)	14	USB3.0_SS4_RX-	Differential SuperSpeed receiver signals (port 3)
6	USB3.0_SS3_RX+		15	USB3.0_SS4_RX+	
7	GND	Ground	16	GND	Ground
8	USB3.0_SS2_TX-	Differential SuperSpeed transmitter signals (port 0)	17	USB3.0_SS3_TX-	Differential SuperSpeed transmitter signals (port 1)
9	USB3.0_SS2_TX+		18	USB3.0_SS3_TX+	



Connector Type

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

Note

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

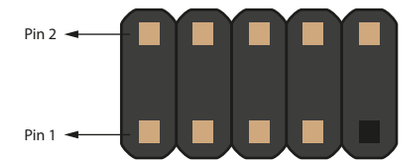
5.6.2 Internal USB Connectors

The conga-IC170 offers four USB ports (ports 7-10) internally. Ports 7 and 8 are routed to connector X16 while port 9 and 10 are routed to connector X15.

Table 25 Connector X16 Pinout Description

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

Internal USB - Connector X16



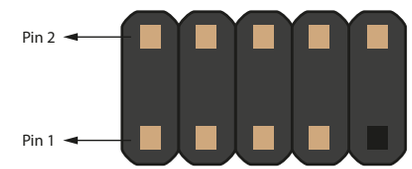
Note

Connector X16 supports Wake-on-USB feature.

Table 26 Connector X15 Pinout Description

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

Internal USB - Connector X15



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Connector Type

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

Note

The +5V signals of connector X15, and X16 have maximum current of 0.5A each.

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

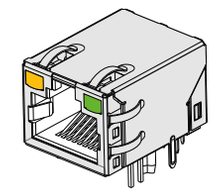
5.7 Ethernet 10/100/1000

The conga-IC170 provides two Gigabit Ethernet ports (connectors X5 and X6) on the rear side. The LAN interface on connector X5 supports Intel AMT technology while that on connector X6 does not support it.

Table 27 Connectors X5/X6 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	N.C	N.C	BI_DC+
5	Not connected or Bidirectional	N.C	N.C	BI_DC-
6	Receive Data- or Bidirectional	RX-	RX-	BI_DB+
7	Not connected or Bidirectional	N.C	N.C	BI_DD+
8	Not connected or Bidirectional	N.C	N.C	BI_DD-

Connector X5/X6



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

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

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5.8 SATA Interfaces

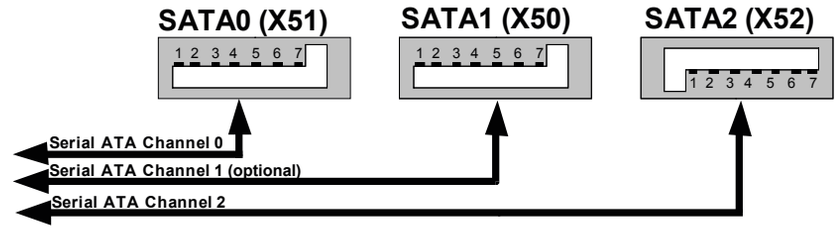
5.8.1 Standard SATA Ports

The conga-IC170 provides three SATA ports - two standard SATA connectors (X50 and X52) and one M.2 connector (X10). The SATA ports support data rates up to 6 Gb/s.

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

Table 28 Connectors X50/X51/X52 Pinout Description.

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



Connector Type

X50,X51,X52: Standard SATA connector

Note

The conga-IC170 offers an additional standard SATA connector (X50). This port is however disabled by default. To enable it, you require a customized BIOS.

Connector X51 supports eSATA devices. Connector X52 supports SATADOM devices on revision A.x and later.

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5.8.2 SATA Power

The conga-IC170 provides an internal SATA power for hard drives on connector X12. This connector supplies 3.3V, 5V and 12V.

Table 29 Connector X12 Pinout Description.

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

SATA Power (X12)

Connector Type

X12: 15-pin standard SATA power connector

Note

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

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

5.8.3 M.2 Slot

The conga-IC170 offers a PCIe M.2, type 3042/2242 slot (X10) for connecting M.2 SSD or WWAN devices. The slot supports SATA SSD and WWAN (USB 2.0) devices by default. PCIe x1 devices are supported only with a customized BIOS.

Table 30 Connector X10 Pinout Description

Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V
3	GND	4	3.3V
5	GND	6	FULL_CARD_PWROFF#
7	USB_D+	8	W_DISABLE_1#
9	USB_D-	10	LED1 (optional)
11	GND	12	N.C

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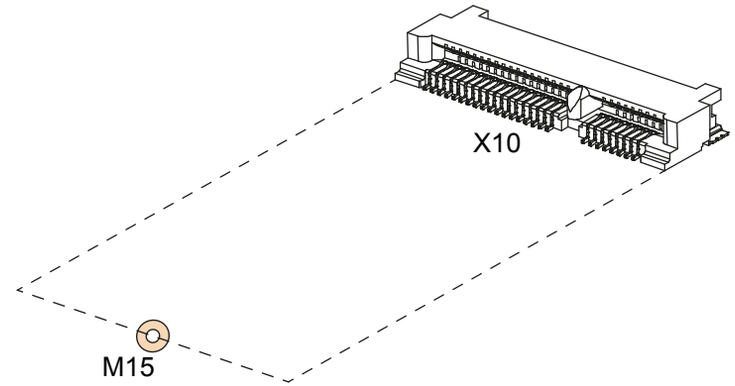
Pin	Signal	Pin	Signal
13	N.C	14	N.C
15	N.C	16	N.C
17	N.C	18	N.C
19	N.C	20	N.C
21	CONFIG_0	22	N.C
23	WoWWAN#	24	N.C
25	N.C	26	W_DISABLE_2#
27	GND	28	GPIO8
29	SSIC_RX- (optional)	30	UIM_RESET
31	SSIC_RX+ (optiona)	32	UIM_CLK
33	GND	34	UIM_DATA
35	SSIC_TX- (optional)	36	UIM_PWR
37	SSIC_RX+	38	DEVSLP
39	GND	40	GNSS_SCL
41	PER0-/SATA_B+	42	GNSS_SDA
43	PER0+/SATA_B-	44	GPIO2
45	GND	46	N.C
47	PET0-/SATA_A-	48	GPIO4
49	PET0+/SATA_A+	50	RESET#
51	GND	52	CLKREQ#
53	REFCLK-	54	PEWAKE#
55	REFCLK+	56	N.C
57	GND	58	N.C
59	N.C	60	COEX3
61	N.C	62	N.C
63	N.C	64	COEX1
65	N.C	66	N.C
67	RESET#	68	SUSCLK
69	CONFIG_1	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	CONFIG_2	75	CONFIG_2

M.2 Type B Socket (Connector X10)



Connector Type

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

5.9 Display Interfaces

The conga-IC170 supports up to three independent displays. The interfaces supported are two Digital Display Interfaces and one LVDS or eDP interface.

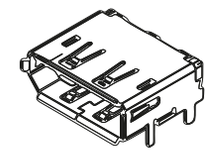
5.9.1 Display Port Interface DP++

The conga-IC170 SBC has two DP++ connectors (X18 and X19) located at the rear I/O panel. These connectors support DP/HDMI/DVI displays.

Table 31 Connectors X18 / X19 Pinout Description.

Pin	Signal	Pin	Signal
1	DDI1_TX0+ / DDI2_TX0+	11	GND
2	GND	12	DDI1_TX3- / DDI2_TX3-
3	DDI1_TX0- / DDI2_TX0-	13	GND
4	DDI1_TX1+ / DDI2_TX1+	14	CEC
5	GND	15	DDPB_AUX+ / DDPC_AUX+
6	DDI1_TX1- / DDI2_TX1-	16	GND
7	DDI1_TX2+ / DDI2_TX2+	17	DDPB_AUX- / DDPC_AUX-
8	GND	18	DDPB_HPD / DDPC_HPD
9	DDI1_TX2- / DDI2_TX2-	19	GND
10	DDI1_TX3+ / DDI2_TX3+	20	3.3V

DP++ Connectors X18/X19



5.9.2 LVDS

The conga-IC170 offers LVDS interface on connector X25 - a 40-pin LVDS connector. The LVDS signals are derived via an eDP to LVDS bridge - a multiplexer that translates the SoC's eDP signals to LVDS signals. The multiplexer routes the eDP signals to LVDS connector X25 by default.

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

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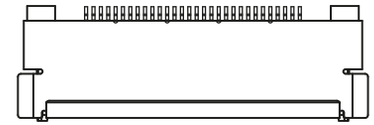
Table 32 Connector X25 Pinout Description

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

LVDS Connector X25



Connector Type

X25: 0.5mm, 40-pin ACES connector

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

Note

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

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

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5.9.3 Embedded Display Port (eDP)

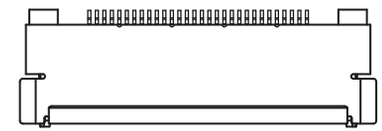
The conga-IC170 provides eDP interface on connector X20 - a standard 40-pin DisplayPort connector. The eDP signals are sourced from incoming eDP stream via a multiplexer. The multiplexer routes the eDP signals to LVDS connector X25 by default. To route the eDP signals to eDP connector X20, change the 'Active LFP Configuration" in the BIOS setup menu to 'eDP'.

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

Table 33 Connector X20 Pinout Description

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

eDP Connector X20



Connector Type

X20: 0.5mm , 40-pin ACES connector

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

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Note

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

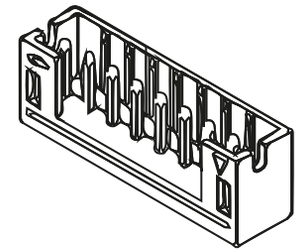
5.9.3.1 Backlight Power Connector

The conga-IC170 provides backlight power on connector X22.

Table 34 Connector X22 Pinout Description

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

Backlight Power - Connector X22



Connector Type

X22: 2mm, 8-pin crimp style connector

Mating connector: Chyao Shiunn JS-1124-08

Note

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

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5.9.3.2 Backlight/Panel Power Selection

The conga-IC170 supports different voltages for the panel and backlight. With jumper X23, you can set the panel voltage to 3,3V, 5V or 12V. With jumper X24, you can set the backlight voltage to 5V or 12V.

Table 35 Connector X23 Pinout Description

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

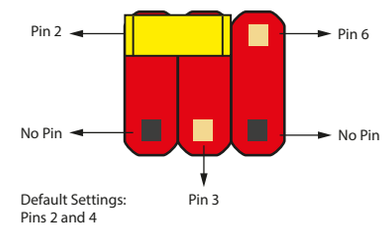
Table 36 Connector X24 Pinout Description

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

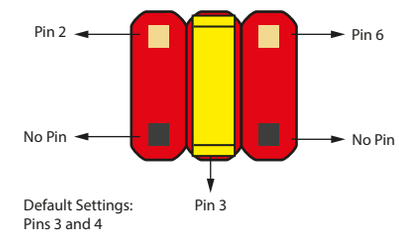
Connector Type

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

Panel Voltage Selector - Jumper X23



Backlight Voltage Selector - Jumper X24



5.9.3.3 Monitor OFF connector

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

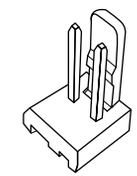
Table 37 Connector X21 Pinout Description

Pin	Function
1	MONITOR_OFF#
2	GND

Connector Type

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

Monitor OFF - Connector X21



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5.9.4 PCI Express

The conga-IC170 provides 3 PCIe interfaces - a PCIe M.2 slot on connector X10 (see section 5.8.3), a PCIe x4 slot on connector X7 and a full/half size mini PCIe slot on connector X8

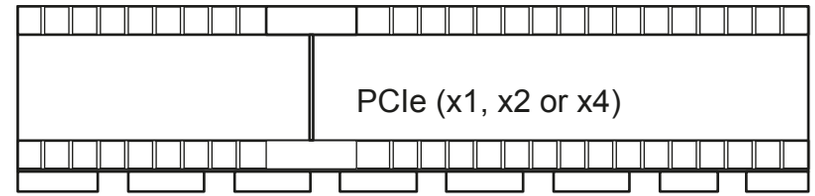
5.9.4.1 PCIe x4 Slot

The conga-IC170 offers a PCIe x4 slot on connector X7.

Table 38 PCIe x4 Slot (Connector X7) Pinout Description

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

PCIe Slot
(Connector X7)



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

Connector Type

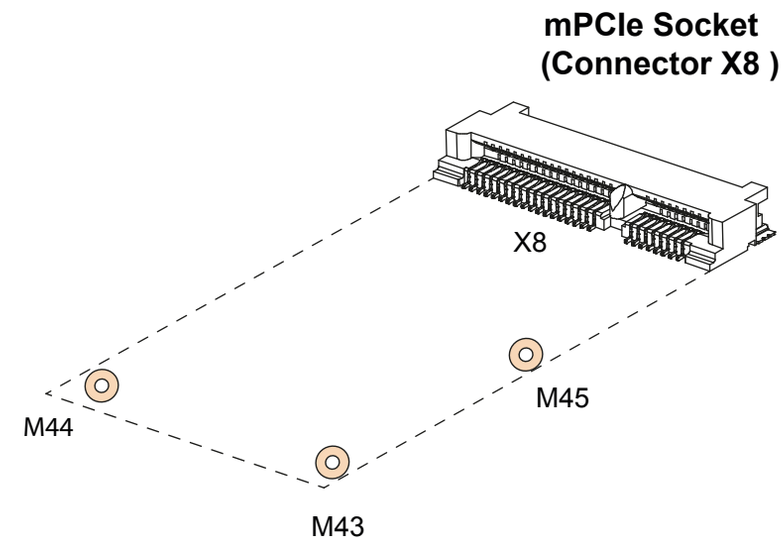
X7: PCIe x4 connector

5.9.4.2 Full/half-size Mini PCIe

The conga-IC170 offers a mini PCIe socket on connector X8. This socket is optimized for mobile computing platforms and provides the ability to insert different removable mini PCIe cards. This approach makes it possible to upgrade standard PCIe mini card devices on the SBC, without extra cost of a redesign.

Table 39 mPCIe (Connector X8) Pinout Description

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



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

Connector Type

X8: PCIe mini card socket

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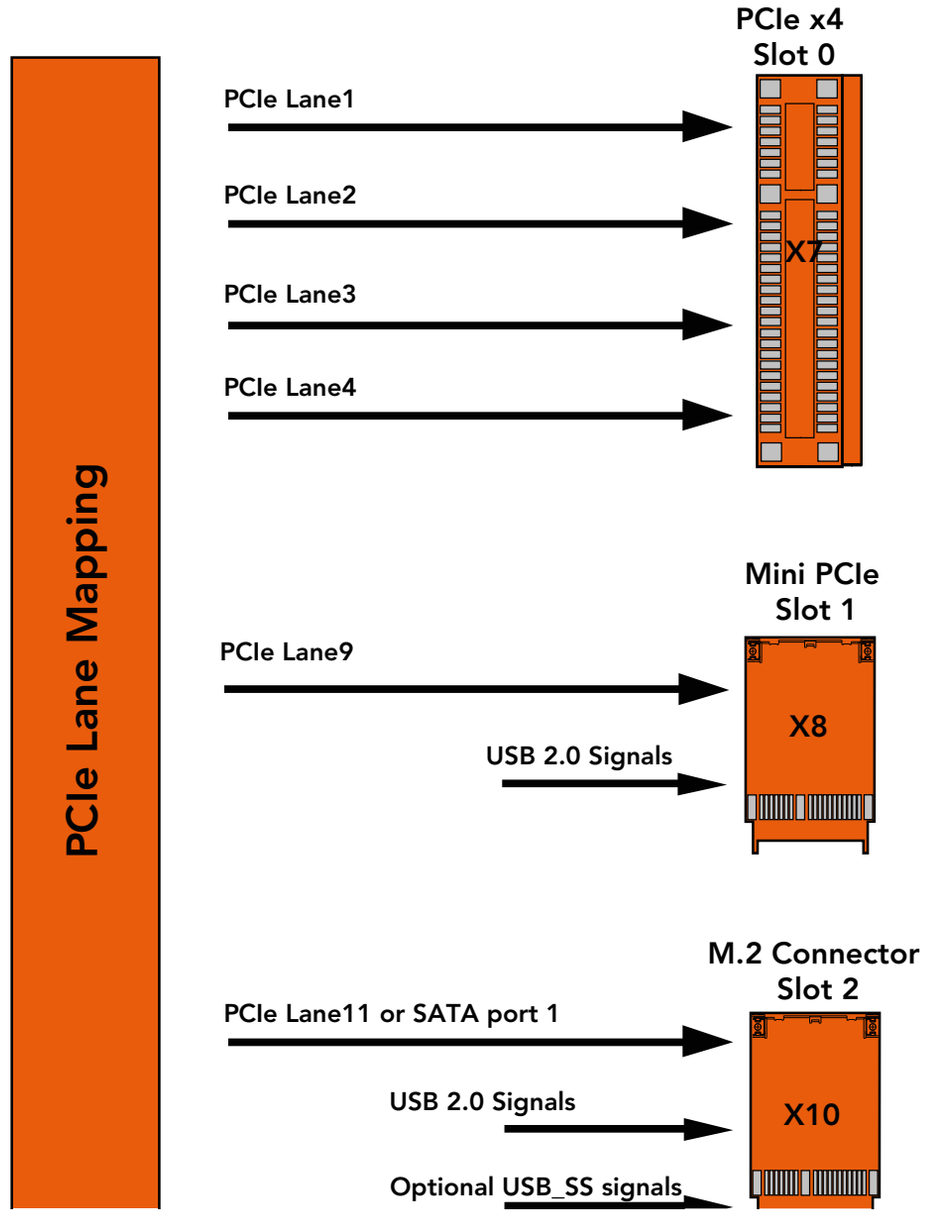
5.9.4.3 PCI Express Routing

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



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6 Additional Features

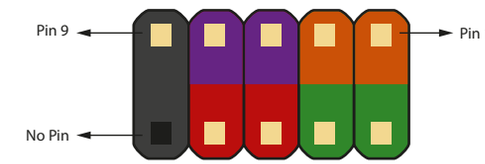
6.1 Front Panel Connector

The conga-IC170 SBC supports front panel features such as power button, status LEDs and reset button via connector X39 - a 10-pin internal header. The FP_LED+ and FP_LED- signals communicate the system states to two LEDs connected to this header. See section 5.1.5 "Power Status LED" for the possible power states and corresponding LED status.

Table 40 Front Panel (Connector X39) Pinout Description

Pin	Signal	Description
1	HDD_POWER_LED+	Hard disk power LED (with 330R pull-up resistor to +3.3V).
2	FP_LED+	Power LED (main color)
3	HDD_LED	Hard disk activity LED
4	FP_LED-	Power LED (alternate color)
5	GND	Ground
6	PWRBTN#	Power Button
7	SYS_RST#	Reset Button
8	GND	Ground
9	+V5S	+5V power supply (500mA power budget)
10	KEY	No pin

Front Panel - Connector X39



Connector Type

X39: 2.54mm,10-pin header

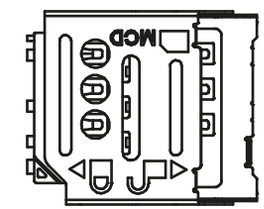
6.2 Micro-SIM Card

The conga-IC170 offers a micro-SIM slot on connector X11 for inserting SIM card.

Table 41 Connector X11 Pinout Description

Pin	Signal	Description
C1	PWR	Power
C2	RST	Reset
C3	CLK	Clock

SIM Slot - Connector X11



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

Connector Type

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

Note

The micro-SIM card slot is connected to M.2 slot by default.

6.3 Micro-SD Card

The conga-IC170 offers a micro-SD slot on connector X60. The SD card slot complies with SDXC card specification 3.0 with support for up to 104 MBps data rate.

Table 42 Connector X60 Pinout Description

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

Connector Type

X60: Micro-SD card socket card

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6.4 MIPI CSI-2

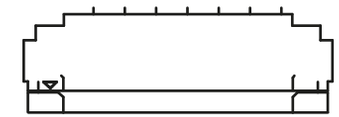
The conga-IC170 offers an onboard camera interface on connector X9. The interface supports up to two independent cameras - four data lanes for the first camera and two data lanes for the second camera. Each lane operates at up to 1.5 Gbps depending on the camera's resolution. It also supports up to 24 MP image capture @ 15fps, full HD 1080p60.

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

Table 43 Connector X9 Pinout Description

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

MIPI - Connector X9



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30	CAM1_CSI_D0-	CSI2 Camera 1 Data Lane 0-
31	CAM1_RST#	Camera 1 Reset (low active, 1.8V)
32	CAM1_CSI_D1+	CSI2 Camera 1 Data Lane 1+
33	CAM1_CSI_D1-	CSI2 Camera 1 Data Lane 1-
34	GND	Ground
35	CAM0_GPIO	GPIO for Camera 0 (1.8V)
36	CAM1_GPIO	GPIO for Camera 1 (1.8V)

Connector Type

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

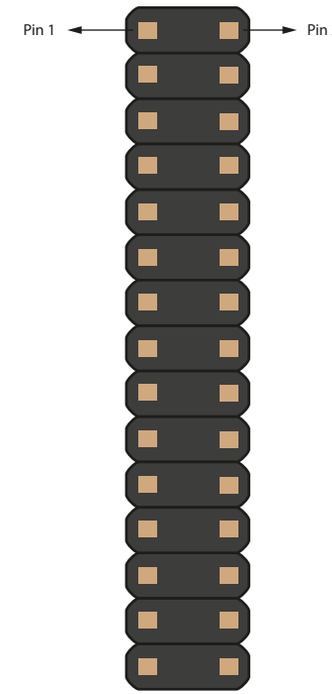
6.5 Integrated Sensor Hub

The conga-IC170 offers an Integrated Sensor Hub (ISH) on connector X61.

Table 44 ISH (Connector X61) Pinout Description

Pin	Signal	Pin	Signal
1	+3.3V	2	+5V
3	+3.3V	4	RSVD
5	N.C	6	I2C0_SDA
7	N.C	8	I2C0_SCL
9	GND	10	I2C1_SDA
11	UART0_RXD	12	I2C1_SCL
13	UART0_TXD	14	GND
15	UART0_RTS	16	GPIO0
17	UART0_CTS	18	GPIO1
19	GND	20	GPIO2
21	UART1_RXD	22	GPIO3
23	UART1_TXD	24	GPIO4
25	UART1_RTS	26	GPIO5 (N.C)
27	UART1_CTS	28	GPIO6 (N.C)
29	GND	30	GPIO7 (N.C)

ISH - Connector X61



Connector Type

X61: 2mm,2x15-pin header

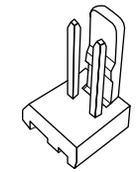
6.6 Case Open Intrusion Connector

The conga-IC170 provides connector X2 for case-open intrusion detection.

Table 45 Case Open Intrusion (Connector X2) Pinout Description

Pin	Function
1	GND
2	INTRUDER#

Case Open Intrusion - Connector X2



Connector Type

X2: 2.54mm, 2-pin Molex KK series connector

6.7 Trusted Platform Module – TPM (Optional)

The conga-IC170 SBC can be equipped optionally with a TPM 1.2/2.0 compliant security chip. The chip is connected to the LPC bus provided by the integrated Intel chipset.

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

6.8 congatec Board Controller (cBC)

The conga-IC170 is equipped with a Texas Instruments Tiva™ microcontroller. This onboard microcontroller plays an important role for most of the congatec BIOS features. It fully isolates some of the embedded features such as system monitoring or the I²C bus from the x86 core architecture, which results in higher embedded feature performance and more reliability, even when the x86 processor is in a low power mode.

6.8.1 Fan Control

The conga-IC170 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.

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6.8.2 Power Loss Control

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

6.8.3 Board Information

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

6.9 Embedded BIOS

The conga-IC170 is equipped with congatec Embedded BIOS, which is based on American Megatrends Inc. Aptio UEFI firmware. The BIOS provides the features described below:

6.9.1 OEM Default Settings and OEM BIOS Logo

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

6.9.2 OEM BIOS Code

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

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

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6.9.3 congatec Battery Management Interface

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

The conga-IC170 BIOS fully supports this interface. For more information about this subject, visit the congatec website and view the following documents:

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

6.9.4 API Support (CGOS)

In order to benefit from the above mentioned non-industry standard feature set, congatec provides an API that allows application software developers to easily integrate all these features into their code. The CGOS API (congatec Operating System Application Programming Interface) is the congatec proprietary API that is available for all commonly used Operating Systems such as Win32, Win64, Win CE and Linux. The architecture of the CGOS API driver provides the ability to write application software that runs unmodified on all congatec CPU modules. All the hardware related code is contained within the congatec embedded BIOS on the module. See section 1.1 of the CGOS API software developers guide, which is available on the congatec website .

6.10 Thermal/Voltage Monitoring

The conga-IC170 SBC features three temperature sensors - the CPU, memory and board controller sensors. The board controller monitors the +12V rail.

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6.11 Beeper

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

Beeper (M16)

6.12 External System Wake Event

The conga-IC170 supports LAN, USB, PCIe and PWRBTN driven wake up events.

6.13 Feature Connector

The conga-IC170 provides an internal 50-pin, 2mm pin header as feature connector. The pinout is described below:

Table 46 Feature Connector X38 Pinout Description

Pin	Signal	Pin	Signal
1	+5V	2	GND
3	LAD0	4	LAD1
5	LAD2	6	LAD3
7	LFRAME#	8	SERIRQ#
9	LPC_CLK (24MHz)	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 X38

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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 (optional)
43	SPI_CS#	44	I2C_CLK
45	SPI_SO	46	BIOS_DISABLE#
47	SPI_CLK	48	SPI_SI
49	+5V Standby	50	GND

Connector Type

X38: 2mm, 2x25-pin header

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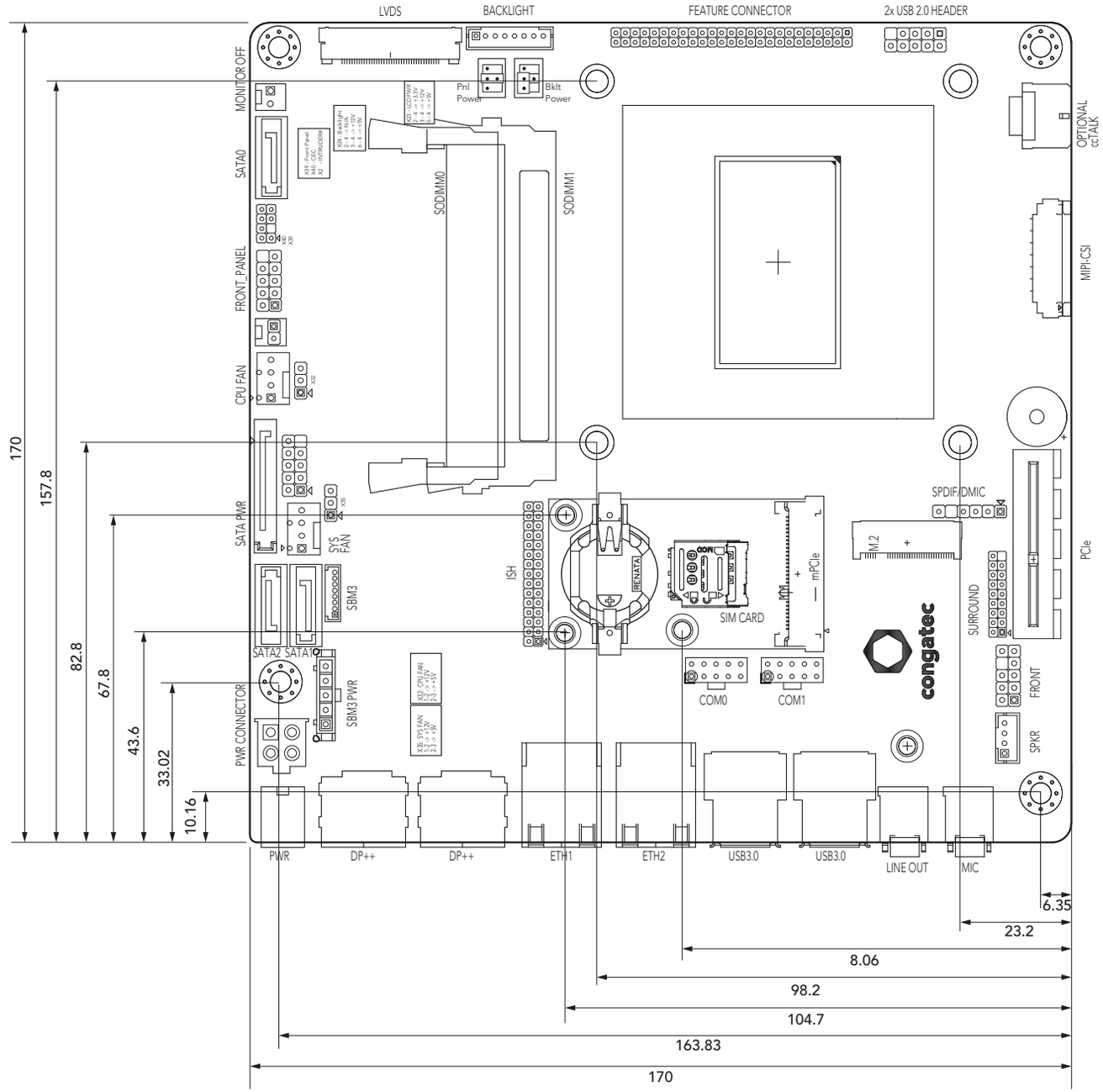
7 conga-IC170 Mechanical Drawing



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 <F2> key during POST.

8.1.1 Boot Selection Popup

The BIOS offers the possibility to access a Boot Selection Popup menu by pressing the <F11> key during POST. If this option is used, a selection will be displayed 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 and two main frames. The menu bar is shown below:

Main	Advanced	Chipset	Security	Boot	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 print indicate BIOS default values.

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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 submenu.
+ - 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 enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. The Main screen reports BIOS, processor, memory and board information and is used to configure the system date and time.

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 congatec board controller firmware revision.
MAC Address (1st Ethernet)	No option	Displays the MAC address of the onboard i218 Ethernet controller.
MAC Address (2nd Ethernet)	No option	Displays the MAC address of the onboard i210/i211 Ethernet controller.
Boot Counter	No option	Displays the number of boot-ups (maximum 16777215).
Running Time	No option	Displays the time the board is running (in hours, maximum 65535).
►Platform Information	Submenu	Opens the 'Platform Information' submenu.
System Date	Day of week, month/day/year	Displays the current system date. **Note:** The date is in month-day-year format.
System Time	Hour:Minute:Second	Displays the current system time. **Note:** The time is in 24-hour format.

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8.3.1 Platform Information Submenu

The platform information submenu offers additional hardware and software information.

Feature	Options	Description
Processor Information	No option	Subtitle.
Processor Type	No option	Displays the processor ID string. The "Processor Type" text is not displayed.
Codename	No option	Displays the processor codename.
Processor Speed	No option	Displays the processor speed.
Processor Signature	No option	Displays the processor signature.
Stepping	No option	Displays the processor stepping.
Processor Cores	No option	Displays the number of processor cores.
Microcode Revision	No option	Displays the processor microcode revision.
IGD HW Version	No option	Displays the version of the graphics controller.
IGD VBIOS Version	No option	Displays the video BIOS version.
Total Memory	No option	Displays the total amount of installed memory.
PCH Information	No option	Subtitle.
Codename	No option	Displays the codename of the Platform Controller Hub (PCH).
PCH SKU	No option	Displays the SKU name of the PCH.
Stepping	No option	Displays the PCH stepping.
ME FW Version	No option	Displays the ME Firmware (FW) Version if available.
ME Firmware SKU	No option	Displays the ME FW SKU if available.

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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. Only enabled features are displayed.

Main	Advanced	Chipset	Boot	Security	Save & Exit
	Graphics				
	Watchdog				
	Module Serial Ports				
	Hardware Health Monitoring				
	Intel® Ethernet Connection (H) I219-LM				
	Driver Health				
	Trusted Computing				
	RTC Wake Settings				
	ACPI				
	Intel® ICC				
	OverClocking Performance Menu				
	PCH-FW Configuration				
	SMART Settings				
	Super IO				
	Serial Port Console Redirection				
	CPU				
	Platform Misc Configuration				
	SATA Configuration				
	Thermal Configuration				
	Acoustic Management				
	PCI & PCI Express				
	UEFI Network Stack				
	CSM & Option ROM Control				
	NVMe Configuration				
	SDIO Configuration				
	USB				
	PC Speaker				

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8.4.1 Graphics Submenu

Feature	Options	Description
Primary Display	**Auto** IGD PEG PCI/PCIe	Select primary graphics adapter to be used during boot up: 'Auto' - Selects it automatically. 'IGD' - Uses the Internal Graphics Device (IGD) located in the chipset. 'PEG' - Uses the external PCI Express Graphics (PEG) card attached to the PEG port. 'PCI/PCIe' - Uses a PCI/PCIe graphics card attached to a PCI/PCIe port.
Internal Graphics Device	**Auto** Disabled Enabled	Set IGD to 'Auto', 'Disabled', or 'Enabled'.
IGD Pre-Allocated Graphics Memory	**32M** 64M 96M 128M 160M 192M 224M 256M 288M 320M 352M 384M 416M 448M 480M 512M 1024M 1536M 2048M	Select amount of pre-allocated graphics memory to be used by the IGD.
IGD Total Graphics Memory	128M **256M** MAX	Select amount of total graphics memory that may be used by the IGD. Memory above the fixed graphics memory is dynamically allocated by the graphics driver acc **Note:** Refer to the DVMT 5.0 specification for more detailed information.
Max. GPU Frequency	**Default** 800 MHz 700 MHz 600 MHz 500 MHz	
Primary IGD Boot Display Device	**Auto** CRT LFP EFP EFP2 EFP3	Select the Primary IGD display device(s) to be used for boot up: 'CRT' - Uses the analog VGA display port. 'LFP' - Uses the LVDS panel connected to the integrated LVDS port. 'EFPx' - Uses the HDMI/DVI or DisplayPort device connected to DDI1, DDI2 and DDI3. **Note:** EFP selections are valid only when at least one DDI is enabled. The first enabled DDI is assigned to EFP. Therefore, EFP and DDI numbering do not necessarily match.

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Feature	Options	Description
Secondary IGD Boot Display Device	**Disabled** CRT LFP EFP EFP2 EFP3	Select the Secondary IGD display device(s) used for boot up. **Note:** VGA modes are only supported on the primary display. For further details, see 'Primary IGD Boot Display Device'.
Active LFP Configuration	No Local Flat Panel **Integrated LVDS** eDP	Select active local flat panel 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.
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	Set PWM inverter polarity.
PWM Inverter Frequency (Hz)	**200** - 40000	Set the PWM inverter frequency in Hertz.

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Feature	Options	Description
Backlight Setting	0% 10% 25% 40% 50% 60% 75% 90% **100%**	Select the backlight value in percentage of the maximum setting.
Force Backlight Enable	**No** Yes	Set to 'Yes', if the operating system driver does not activate the backlight signal.
Inhibit Backlight	**No** Permanent Until End Of POST	Select whether the backlight enable signal should be activated when the panel is activated. **Note:** The signal should be permanently activated or remain inhibited until the end of BIOS POST.
Backlight Delay	**No delay** 100ms Delay 250ms Delay 500ms Delay 1s Delay	Select delay to adjust LVDS panel timings. **Note:** The congatec board controller will add the delay to the backlight signal coming from the SoC according this setup node. This feature may help to avoid panel flickering.
Invert Backlight Setting	**No** Yes	Set 'Yes' to invert backlight control values. **Note:** This feature may be required for the actual I2C type backlight hardware controller.
LVDS SSC	**Disabled** 0.5% 1.0% 1.5% 2.0% 2.5%	Select LVDS spread spectrum clock modulation depth. **Note:** Performs center spreading and DDI1 fixed modulation frequency of 32.9kHz.
Digital Display Interface 1 (DDI1)	**Auto Selection** Disabled DisplayPort HDMI/DVI	Select the output type of the DDI.
Digital Display Interface 2 (DDI2)	**Auto Selection** Disabled DisplayPort HDMI/DVI	Select the output type of the DDI.
Digital Display Interface 3 (DDI3)	**Auto Selection** Disabled DisplayPort HDMI/DVI	Select the output type of DDI3. **Note:** If 'VGA Port' is enabled, 'Auto Selection' and 'DisplayPort' are not supported.
VGA Port	**Disabled** Enabled	Enable or disable VGA port. **Note:** If enabled, the Auto Selection and DisplayPort is not supported on DDI3.

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8.4.2 Watchdog Submenu

Feature	Options	Description
POST Watchdog	**Disabled** 30sec 1min 2min 5min 10min 30min	Select the timeout value for the POST watchdog. **Note:** The watchdog is only active during the system POST 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 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	Select the delay time before the runtime watchdog is activated. **Note:** This feature may be used to ensure that the operating system has enough time to load.
Event 1	ACPI Event **Reset** Power Button	Select the type of event that will be generated when timeout 1 is reached. For more information about ACPI Event read the note at the end of this table.
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.

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Feature	Options	Description
Timeout 1	1sec 2sec 5sec 10sec **30sec** 1min 2min 5min 10min 30min	Select the timeout value for the first stage watchdog event.
Timeout 2	see above	Select the timeout value for the second stage watchdog event.
Timeout 3	see above	Select the timeout value for the third stage watchdog event.
Watchdog ACPI Event	Shutdown Restart	Select the operating system event to be initiated by the watchdog ACPI event. This feature performs a critical but orderly operating system shutdown or restart.

Note

In ACPI mode, it is not possible for a "Watchdog ACPI Event" handler to directly restart or shutdown the OS. The congatec BIOS will perform one of the following actions instead:

Shutdown: An over temperature notification is executed. This causes the operating system to shut down in an orderly fashion.

Restart: An ACPI fatal error is reported to the OS.

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8.4.3 Module Serial Ports Submenu

Feature	Options	Description
Serial Port 0	**Disabled** Enabled	Enable or disable module serial port 0.
I/O Base Address	3F8h 2F8h 220h 228h 238h 2E8h 338h **3E8h**	Set serial port base address.
Interrupt	None IRQ3 IRQ4 **IRQ5** IRQ6 IRQ14 IRQ15	Set serial port interrupt.
PNP ID	None PNP0501 **CGT0501**	Set serial port ACPI ID.
Baudrate	**2400** 4800 9600 19200 38400 57600 115200	Set serial port initial baudrate.
Serial Port 1	**Disabled** Enabled	Enable or disable module serial port 1.
I/O Base Address	3F8h 2F8h 220h 228h 238h **2E8h** 338h 3E8h	Set serial port base address.

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Feature	Options	Description
Interrupt	None IRQ3 IRQ4 IRQ5 **IRQ6** IRQ14 IRQ15	Set serial port interrupt.
PNP ID	None PNP0501 CGT0501 **CGT0502**	Set serial port ACPI ID.
Baudrate	**2400** 4800 9600 19200 38400 57600 115200	Set serial port initial baudrate.

8.4.4 Intel® Ethernet Connection (H) I219-LM Submenu

Feature	Options	Description
► NIC Configuration	Submenu	Opens the NIC Configuration submenu.
Blink LEDs	0 (more values)	Set the duration in seconds for the Ethernet LEDs to blink.
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 in which the Ethernet controller is integrated.
PCI Device ID	No option	Displays the PCI Device ID of the Ethernet controller.
PCI Address	No option	Displays the PCI Bus:Device:Function number of the Ethernet controller.
Link Status	No option	Displays the Link Status.
MAC Address	No option	Displays the MAC Address.

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8.4.4.1 NIC Configuration Submenu

Feature	Options	Description
Link Speed	**Auto Negotiated** 10 Mbps Half 10 Mbps Full 100 Mbps Half 100 Mbps Full	Select the port speed used for the selected boot protocol.
Wake On LAN	**N/A** Disabled Enabled	Enable for the server to power on after receiving an in-band magic packet.

8.4.5 Driver Health Submenu

Feature	Options	Description
Intel® Gigabit 0.0.09	**Healthy**	Provides Health Status for the drivers/controllers.

8.4.6 Trusted Computing Submenu

Feature	Options	Description
Security Device Support	Disable **Enable**	Enable or disable BIOS support for security device. Operating system will not show the security device. TCG EFI protocol and INT1A interface will not be available.

Note

Additional lines are shown in this submenu if a TPM device is connected.

8.4.7 RTC Wake Settings Submenu

Feature	Options	Description
RTC Wake Mode	**Disabled** Wake from S4 and S5 Wake from S3, S4 and S5	Set system wake mode on alarm event. Enable this feature to wake from the specified Sx states on the hr::min::sec as specified.

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Feature	Options	Description
Wake up hour	**0**	Specify wake up hour. For example: Enter 3 for 3am and 15 for 3pm.
Wake up minute	**0**	Specify wake up minute.
Wake up second	**0**	Specify wake up second.

8.4.8 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 system's ability to hibernate (operating system S4 sleep state). **Note:** Ensure that your operating system supports this feature if you want to use 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 or disable locking of legacy resources.
S3 Video Repost	**Disabled** Enabled	Enable or disable video BIOS re-post on S3 resume. **Note:** Enable this feature if it is required by your operating system.
ACPI Low Power S0 Idle	**Disabled** Enabled	Enable or disable ACPI low power S0 idle support.
Automatic Critical Trip Point	Disabled **Enabled**	Enable this feature to set the critical trip point (temperature threshold) to the recommended value at which the ACPI aware operating system performs a critical shutdown automatically. Disable this feature to configure the critical trip point manually.
Critical Trip Point Value	71 C 79 C 87 C 95 C **100 C** 103 C 111 C 119 C 127 C	Select the temperature threshold at which the ACPI aware operating system performs a critical shutdown.
Lid Button Support	**Disabled** Enabled	If this feature is enabled, the COM Express LID# signal acts as ACPI lid.
Sleep Button Support	**Disabled** Enabled	If this feature is enabled, the COM Express SLEEP# signal acts as ACPI sleep button.

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8.4.9 Intel® ICC Submenu

Feature	Options	Description
ICC/OC Watchdog Timer	**Disabled** Enabled	Enable this feature to expose the ICC/OC watchdog timer to the operating system as an ACPI device. **Note:** WDT HW is always used by BIOS when clock settings are changed.
ICC Locks after EOP	Default	
ICC Profile	0	

8.4.10 OverClocking Performance Submenu

The description of this feature is beyond the scope of this document.

8.4.11 PCH-FW Configuration Submenu

Displayed only if this feature is enabled.

Feature	Options	Description
ME FW Version	No option	Displays ME FW Version.
ME Firmware Mode	No option	Displays ME Firmware Mode.
ME Firmware Type	No option	Displays ME Firmware Type.
ME Firmware SKU	No option	Displays ME Firmware SKU.
PTT Capability / State	No option	Displays PTT Capability / State.
NFC Support	No option	Displays NFC Support.
ME State	Disabled **Enabled**	Enable to set ME to Soft Temporary Disabled.
fTPM Switch Selection	**GPDMA Work-Around** MSFT QFE Solution	Selects the desired fTPM solution to be used.
TPM Device Selection	**dTPM 1.2** PTT	Select TPM device: 'PTT' - Enables PTT and disables dTPM in SkuMgr. 'dTPM 1.2' - Enables dTPM 1.2 and disables PTT in SkuMgr. **Warning:** If you enable PTT, dTPM will be disabled and all data saved on it will be lost. Likewise, if you enable dTPM, PTT will be disabled and all data saved on it will be lost.
►Firmware Update Configuration	Submenu	Opens submenu to configure management engine technology parameters.
Me FW Image Re-Flash	**Disabled** Enabled	Enable or disable Me FW Image Re-Flash function.

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8.4.12 SMART Settings Submenu

Feature	Options	Description
SMART Self Test	**Disabled** Enabled	Run SMART self test on all HDDs during POST.

8.4.13 Super IO Submenu

Feature	Options	Description
Super IO Chip	W83627	
SIO Clock	**24MHz**	Super IO base clock.
Serial Port	Disabled **Enabled**	Enable or disable serial port (COM).
Device Settings	IO=3F8h IRQ=4	Displays the currently used settings.
Serial Port	Disabled **Enabled**	Enable or disable serial port (COM).
Device Settings	O=2F8h IRQ=3	Displays the currently used settings.
Parallel Port	**Disabled** Enabled	Enable or disable parallel port (LPT/LPTE).
Device Settings	IO=378h IRQ=5	Displays the currently used settings.
Device Mode	**STD Printer Mode** SPP Mode EPP-1.9 and SPP Mode EPP-1.7 and SPP Mode ECP Mode ECP and EPP 1.9 Mode ECP and EPP 1.7 Mode	Select the parallel port mode.

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8.4.14 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 the console redirection configuration submenu.
► Legacy Console Redirection Settings	Submenu	Opens the Legacy Console Redirection Settings submenu.
Serial Port for Out-of-Band Management / Windows Emergency Management Services (EMS) Console Redirection	**Disabled** Enabled	Enable or disable the Serial Port for Out-of-Band Management/ Windows Emergency Management Services (EMS) Console Redirection.
►Console Redirection Settings	Submenu	Opens the console redirection configuration submenu.

8.4.14.1 Console Redirection Settings Submenu

Feature	Options	Description
Terminal Type	VT100 VT100+ VT-UTF8 **ANSI**	Select terminal type.
Baudrate	9600 19200 38400 57600 **115200**	Select baud rate.
Data Bits	7 **8**	Set the number of data bits.
Parity	**None** Even Odd Mark Space	Select the parity.
Stop Bits	**1** 2	Set the number of stop bits.
Flow Control	**None** Hardware RTS/CTS	Select the flow control.

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Feature	Options	Description
VT-UTF8 Combo Key Support	Disabled **Enabled**	Enable 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 the extended terminal resolution.
Legacy OS Redirection Resolution	**80x24** 80x25	Select the number of rows and columns supported for legacy operating system redirection.
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select function key and keypad on Putty.
Redirection After BIOS POST	**Enabled** Disabled	Enable to continue serial redirection after POST.

Note

The Out-of-Band Management/ Windows Emergency Management Services (EMS) Console Redirection Submenu does not have all the features listed above. It however contains the Out-of-Band Management Port selection feature which is not listed above.

8.4.15 CPU Submenu

Feature	Options	Description
►CPU Information	Submenu	
Set Boot Freq Ratio	**255** (more values)	Sets the boot ratio. Range: 4 – 28. If ratio is out of range, maximum ratio is used. Non-ACPI operating systems use this ratio.
Hyper-Threading	Disabled **Enabled**	Enable or disable the Hyper-Threading technology.
Active Processor Cores	**All** 1 2 3	Enable the desired number of cores.
Overclocking Lock	**Disabled** Enabled	FLEX_RATIO(194) MSR.
Intel® Virtualization Technology	Disabled **Enabled**	Enable this feature if you need a VMM to utilize the integrated hardware virtualization support.

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Feature	Options	Description
Hardware Prefetcher	Disabled **Enabled**	Enable or disable the MLC streamer prefetcher.
Adjacent Cache Line Prefetch	Disabled **Enabled**	Enable or disable prefetching of adjacent cache lines.
CPU AES	Disabled **Enabled**	Enable or disable CPU Advanced Encryption Standard (AES) instructions.
Boot performance mode	Max Battery **Max Non-Turbo Performance** Turbo Performance	Select the performance state the BIOS will set before operating system handoff.
Intel® Speed Shift Technology	Disabled **Enabled**	Enable this feature to expose the CPPC v2 interface, allowing hardware controlled P-states.
Intel® SpeedStep(tm)	Disabled **Enabled**	Enable this feature if you require support for more than two frequency ranges.
Turbo Mode	Disabled **Enabled**	Enable or disable 'Turbo Mode'.
P-State Reduction	Disabled by 1 by 2 by 3 by 4 by 5 by 6 by 7 by 8	Limits the maximum non-turbo CPU performance state in an ACPI operating system.
Package Power Limit Lock	**Disabled** Enabled	If this feature is enabled, PACKAGE_POWER_LIMIT MSR will be locked and a reset will be required to unlock the register.
1-Core Ratio Limit Override	**0** (more values)	This limit is for 1 cores active. '0' sets the factory-configured value.
2-Core Ratio Limit Override	**0** (more values)	This limit is for 2 cores active. '0' sets the factory-configured value.
3-Core Ratio Limit Override	**0** (more values)	This limit is for 3 cores active. '0' sets the factory-configured value.
4-Core Ratio Limit Override	**0** (more values)	This limit is for 4 cores active. '0' sets the factory-configured value.
Configurable TDP Boot Mode	**Nominal** Down Up Deactivate	The "Deactivate" option sets MSR to nominal and MMIO to zero.
Configurable TDP Lock	**Disabled** Enabled	Configurable TDP Mode Lock sets the Lock bits on TURBO_ACTIVATION_RATIO and CONFIG_TDP_CONTROL. **Note:** When cTDP Lock is enabled, Custom ConfigTDP Count is forced to 1 and Custom ConfigTDP Boot Index is forced to 0.

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Feature	Options	Description
CTDP BIOS control	**Disabled** Enabled	Enable or disable CTDP control via runtime ACPI BIOS methods. **Note:** This "BIOS only" feature does not require EC or driver support.
Platform PL1 Enable	**Disabled** Enabled	Enable or disable the platform Power Limit 1 (PL1) programming. If this option is enabled, the PL1 is used by the processor to limit the average power of a given time window.
Platform PL1 Power	**0** (more values)	Platform Power Limit 1 Power in milliwatts and step size is 125mW. Any value can be programmed between maximum and minimum power limits (specified by PACKAGE_POWER_SKU_MSR). This setting will act as the new PL1 value for the Package RAPL algorithm.
Platform PL1 Time Window	**0** (more values)	Platform Power Limit 1 Time Window value (in seconds). The value may vary from 0 to 128.
Platform PL2 Enable	**Disabled** Enabled	Enable or disable the platform Power Limit 2 (PL2) programming. If this option is disabled, the BIOS will program the default values for platform PL2.
Platform PL2 Power	**0** (more values)	Platform Power Limit 2 Power in milliwatts and stepsize is 125mW. Any value can be programmed between maximum and minimum power limits (specified by PACKAGE_POWER_SKU_MSR). This setting will act as the new PL2 value for the Package RAPL algorithm.
CPU C States	**Disabled** Enabled	Enable or disable CPU C states.
Enhanced C1 State	Disabled **Enabled**	If this feature is enabled, the CPU will switch to minimum speed when all cores enter C-State.
C-State Auto Demotion	Disabled C1 C3 **C1 and C3**	Configure C-State Auto Demotion.
C-State Un-demotion	Disabled C1 C3 **C1 and C3**	Configure C-State Un-demotion.
Package C State Demotion	Disabled **Enabled**	Configure C-State demotion.
Package C State Undemotion	Disabled **Enabled**	Configure C-State Un-demotion.
CState Pre-Wake	Disabled **Enabled**	Disable this feature to set bit 30 of POWER_CTL MSR(0x1FC) to 1, disabling the Cstate Pre-Wake.
Package C State Limit	C0/C1 C2 C3 C6 C7 C7s C8 C9 C10 **AUTO**	Package C state limit.
CFG Lock	Disabled **Enabled**	Configure MSR 0xE2[15], CFG lock bit.
▶Power Limit 3 Settings	Submenu	

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Feature	Options	Description
Power Limit 3 Override	**Disabled** Enabled	Enable or disable power limit 3 override. If this feature is disabled, BIOS will keep the default values for 'Power Limit 3' and 'Power 'Limit 3 Time'.
CPU Power Limit 3	**0** (more values)	Set CPU power limit 3 value.
CPU Power Limit 3 Time	**0** (more values)	Set time window in which the PowerLimit 3 is maintained.
CPU Power Limit 3 Duty Cycle	**0** (more values)	Specify the duty cycle (in percentage) the CPU is required to maintain over the configured power limit 3 time windows.
Power Limit 3 Lock	Disabled **Enabled**	'Enable' - Locks PL3 configuration in the operating system. 'Disable' - Allows PL3 configurations in the operating system.
►Power Limit 4 Settings	Submenu	
Power Limit 4 Override	**Disabled** Enabled	If this feature is disabled, BIOS will keep the default values for Power Limit 4.
Power Limit 4	**0** (more values)	Select power limit 4 in in 125mW steps. '0' sets the default value.
Power Limit 4 Lock	**Disabled** Enabled	Enable or disable power limit 4 MSR 601h lock. 'Enable' - Locks PL4 configuration in the operating system. 'Disable' - Allows PL4 configurations in the operating system.
►CPU Thermal Configuration	Submenu	
CPU DTS	**Disabled** Enabled	'Disabled' - ACPI thermal management uses EC reported temperature values. 'Enabled' - ACPI thermal management uses DTS SMM mechanism to obtain CPU temperature values. 'Out of Spec' - ACPI Thermal Management uses EC reported temperature values and DTS SMM is used to handle Out of Spec.
TCC Activation Offset	**0** (more values)	Set the offset from the Intel® factory Thermal Control Circuit (TCC) activation temperature. For example: If the factory TCC activation temperature is 100C, enter 10 to activate TCC at 90C. **Note:** TCC activation will lower CPU core and graphics core frequency, voltage or both.
ACPI 3.0 T-States	**Disabled** Enabled	Enable or disable ACPI 3.0 T-states.
Intel® TXT(LT) Support	**Disabled** Enabled	Enable or disable Intel® TXT(LT) support.
Debug Interface	**Disabled** Enabled	Enableor disable CPU debug feature.
Debug Interface Lock	**Disabled** Enabled	Lock CPU debug feature setting.
SW Guard Extensions (SGX)	Disabled Enabled **Software Controlled**	Enable or disable Software Guard Extensions (SGX).

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Feature	Options	Description
Select Owner EPOCH input type	**No Change in Owner EPOCHs** Change to New Random Owner EPOCHs Manual User Defined Owner EPOCHs	Select owner EPOCH mode. Each EPOCH is 64-bit.
PRMRR Size	AUTO	

8.4.15.1 CPU Information

Feature	Options	Description
Processor Type	No option	Displays the processor ID string. The "Processor Type" text is not displayed.
CPU Signature	No option	Displays the CPU signature.
Microcode Patch	No option	Displays the revision of the microcode patch.
Max CPU Speed	No option	Displays the maximum CPU speed.
Min CPU Speed	No option	Displays the min CPU speed.
CPU Speed	No option	Displays the current CPU speed.
Processor Cores	No option	Displays the number of the processor cores.
Intel® HT Technology	No option	Displays whether Intel® HT technology is supported.
Intel® VT-x Technology	No option	Displays whether Intel® VT-x technology is supported.
Intel® SMX Technology	No option	Displays whether Intel® SMX technology is supported.
64-bit	No option	Displays whether 64-bit is supported.
EIST Technology	No option	Displays whether enhanced Intel® SpeedStep Technology (EIST) is supported.
CPU C3 State	No option	Displays whether CPU C3 state is supported.
CPU C6 State	No option	Displays whether CPU C6 state is supported.
CPU C7 State	No option	Displays whether CPU C7 state is supported.
CPU C8 State	No option	Displays whether CPU C8 state is supported.
CPU C9 State	No option	Displays whether CPU C9 state is supported.
CPU C10 State	No option	Displays whether CPU C10 state is supported.
L1 Data Cache	No option	Displays the size of the L1 data cache.
L1 Code Cache	No option	Displays the size of the L1 code cache.
L2 Cache	No option	Displays the size of the L2 cache.
L3 Cache	No option	Displays the size of the L3 cache.
L4 Cache	No option	Displays the size of the L4 cache.

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8.4.16 Platform Misc Configuration Submenu

Feature	Options	Description
Native PCI Express Support	Disabled **Enabled**	Enable or disable native operating system PCIe support.
Native ASPM	**Disabled** Enabled Auto	Enable this feature to let the operating system control ASPM support of the PCIe device. Disable this feature to let the BIOS control ASPM support of the PCIe device.
BDAT ACPI Table Support	**Disabled** Enabled	Enable this feature to support the BDAT ACPI table.
Intel® Ready Mode Technology	**Disabled** Enabled	Enable or disable the ready mode support based on Windows away-mode. **Note:** Only available on DT/AIO.
ACPI Debug	**Disabled** Enabled	Enable this feature to open a memory buffer for storing debug strings. **Note:** Use the method ADBG to write strings to buffer.
PTID Support	**Disabled** Enabled	Enable this feature to load the PTID SSDT table.
PECI Access Method	**Direct I/O** ACPI	Select 'Direct I/O' or 'ACPI PECI' access method.
PCI Delay Optimization	**Disabled** Enabled	Enable this feature to use experimental ACPI additions for FW latency optimizations.
►DPTF Configuration	Submenu	The description of this feature is beyond the scope of this document.
►Platform Setting	Submenu	The description of this feature is beyond the scope of this document.

8.4.17 SATA Submenu

Feature	Options	Description
SATA Controller(s)	**Enabled** Disabled	Enable or disable the onboard SATA controller(s).
SATA Mode Selection	**AHCI** RAID	Select SATA controller mode. **Note:** RAID option is not supported on all chipsets.
CR#1 - RST Pcie Storage Remapping	Enabled **Disabled**	Enable or disable RST PCIe storage remapping.

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Feature	Options	Description
CR#1 - Remap Port Selection	**Auto** Port 9 Port 10 Port 11 Port 12	Select port for RST PCIe storage remapping,
CR#2 - RST Pcie Storage Remapping	Enabled **Disabled**	Enable or disable RST Pcie storage remapping.
CR#2 - Remap Port Selection	**Auto** Port 13 Port 14 Port 15 Port 16	Select port for RST PCIe storage remapping,
CR#3 - RST Pcie Storage Remapping	Enabled **Disabled**	Enable or disable RST PCIe storage remapping.
CR#3 - Remap Port Selection	**Auto** Port 17 Port 18 Port 19 Port 20	Select port for RST PCIe storage remapping.
SATA Test Mode	Enabled **Disabled**	Only enable this feature for verification measurements.
Alternate ID	Enabled **Disabled**	Enable this feature to report an alternate device ID. **Note:** Displayed only for RAID SATA mode.
► Software Feature Mask Configuration	Submenu	RAID option ROM and Intel® Rapid Storage Technology driver will refer to the 'Software Feature Mask Configuration' to enable or disable the storage features.
Aggressive LPM Support	Enabled **Disabled**	Enable PCH to aggressively enter link power state.
Serial ATA Port 0, 1, 2	No option	Displays the name of the connected Hard Disk or DVDROM if the port is enabled. No options are displayed if the port is disabled or when the port is enabled but no device is connected to it.
Software Preserve	No option	Indicates whether the detected drive supports software settings preservation.
SATA Port	Disabled **Enabled**	Enable or disable the relevant SATA port.
Hot Plug	**Disabled** Enabled	Enable or disable hot plug support for relevant SATA port.
External SATA	**Disabled** Enabled	Enable or disable external SATA support on relevant SATA port.
Spin Up Device	**Disabled** Enabled	Enable this feature to run an initialization sequence for the connected device during startup at relevant SATA port. **Note:** Enable this feature if your hard disk or special (special) solid-state drive requires it.

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Feature	Options	Description
SATA Device Type	**Hard Disk Drive** Solid State Drive	Select whether the relevant SATA port is connected to solid-state drive or a hard disk drive.
Topology	**Unknown** ISATA, Direct Connect Flex M2	Select the SATA topology.
Device Sleep	**Disabled** Enabled	Enable or disable mSata for RTD3.
SATA DEVSLEP Idle Timeout Config	**Disabled** Enabled	Enable or disable SATA DTIO Config.

8.4.17.1 Software Feature Mask Configuration

Feature	Options	Description
RAID0	Disabled **Enabled**	Enable or disable RAID0 feature.
RAID1	Disabled **Enabled**	Enable or disable RAID1 feature.
RAID10	Disabled **Enabled**	Enable or disable RAID10 feature.
RAID5	Disabled **Enabled**	Enable or disable RAID5 feature.
Intel® Rapid Recovery Technology	Disabled **Enabled**	Enable or disable Intel® Rapid Recovery Technology.
Option ROM UI and Banner	Disabled **Enabled**	Enable this feature to display the option ROM user interface. **Note:** No option ROM banner or information are displayed if all disks and RAID volumes are normal.
HDD Unlock	Disabled **Enabled**	If this feature is enabled, the HDD password unlock option is available in the operating system.
LED Locate	Disabled **Enabled**	Enable or disable 'LED Locate'.
IRRT Only on eSATA	Disabled **Enabled**	If this feaute is enabled, only Intel® Rapid Recovery Technology (IRRT) volumes can span internal and external SATA (eSATA) drives. If this feautre is disabled, only RAID volume can span internal and eSATA drives.
Smart Response Technology	Disabled **Enabled**	Enable or disable 'Intel® Smart Response Technology'.

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Feature	Options	Description
Option ROM UI Normal Delay	**2 Seconds** 4 Seconds 6 Seconds 8 Seconds	If this feature is enabled, select the delay of the option ROM user interface splash screen in normal status.
RST Force Form	**Disabled** Enabled	Enable or disable form for Intel® Rapid Storage Technology.

8.4.18 Thermal Configuration Submenu

Feature	Options	Description
►Platform Thermal Configuration	Submenu	
PCH Thermal Device	Disabled **Enabled in PCI mode** Enabled in ACPI mode	Enable or disable PCH thermal device (D20:F2).
PCH Temp Read	Disabled **Enabled**	Disable or enable PCH temperature read.
CPU Energy Read	Disabled **Enabled**	Disable or enable CPU energy read.
CPU Temp Read	Disabled **Enabled**	Disable or enable CPU temperature read.
Alert Enable Lock	**Disabled** Enabled	Lock all alert enable settings.

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8.4.19 Acoustic Management Submenu

Feature	Options	Description
Acoustic Management Configuration	**Disabled** Enabled	Disable or enable 'Acoustic Management Configuration'.
SATA Port 0 Disk drive name Acoustic Mode	**Bypass** Quiet Max Performance	Select acoustic noise level and performance optimization of optical or hard disk drives: 'Bypass' - Uses drive's preset value. 'Quiet' - Reduces the drive's speed. 'Max Performance' - Maximizes the drive's speed.
SATA Port 1 Disk drive name Acoustic Mode	**Bypass** Quiet Max Performance	Same as at SATA Port 0.
SATA Port 2 Disk drive name Acoustic Mode	**Bypass** Quiet Max Performance	Same as at SATA Port 0.
SATA Port 3 Disk drive name Acoustic Mode	**Bypass** Quiet Max Performance	Same as at SATA Port 0.

Note

SATA ports are only displayed if an optical or hard disk drive is detected.

8.4.20 PCI & PCI Express Submenu

Feature	Options	Description
PCI Bus Driver Version	No option	
PCI Settings		
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 value to be programmed into PCI latency timer register.

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Feature	Options	Description
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 value to be programmed into the 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 feautre for 64-bit capable devices to be decoded in Above 4G address space. **Note:** The system must support 64 bit PCI decoding for this feature.
Don't Reset VC-TC Mapping	**Disabled** Enabled	If the system has Virtual Channels, software can reset traffic class mapping to its default state through virtual channels. **Note:** Enabling this feature will not modify VC resources.
►PCI Hot-Plug Settings	Submenu	

8.4.20.1 PCI Hot Plug Settings Submenu

Feature	Options	Description
BIOS Hot-Plug Support	Disabled **Enabled**	Enable this feature to allow BIOS build in hot-plug support. **Note:** Use this feature if the operating system does not support PCIe and SHPC hot-plug natively.
PCI Buses Padding	Disabled **1** 2 3 4 5	Padd PCI buses behind the bridge for hot-plug.
I/O Resources Padding	Disabled **4 K** 8 K 16 K 32 K	Select padd PCI I/O resources behind the bridge for hot-plug.

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Feature	Options	Description
MMIO 32 bit Resources Padding	Disabled 1 M 2 M 4 M 8 M **16 M** 32 M 64 M 128 M	Select padd PCI MMIO 32-bit resources behind the bridge for hot-plug.
PFMMIO 32 bit Resources Padding	Disabled 1 M 2 M 4 M 8 M **16 M** 32 M 64 M 128 M	Select padd PCI MMIO 32-bit prefetchable resources behind the bridge for hot-plug.

8.4.21 UEFI Network Stack Submenu

Feature	Options	Description
UEFI Network Stack	**Disabled** Enabled	Enable or disable the UEFI network stack.
IPv4 PXE Support	Disabled **Enabled**	Enable or disable IPv4 PXE boot support. If disabled, IPv4 PXE boot option will not be created.
IPv6 PXE Support	Disabled **Enabled**	Enable or disable IPv6 PXE boot support. If disabled, IPv6 PXE boot option will not be created.
PXE boot wait time	**0** (more values)	Set wait time to press ESC key to abort the PXE boot.
Media detect count	**1** (more values)	Set the number of times to check for the presence of media.

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8.4.22 CSM & Option ROM Control Submenu

Feature	Options	Description
CSM Support	Disabled **Enabled**	Enable or disable CSM support.
CSM16 Module Version	No option	
Gate A20 Active	**Upon Request** Always	'Upon Request' - Gate A20 can be disabled with BIOS services. 'Always' - Gate A20 cannot be disabled. **Note:** This feature is useful if runtime code above 1MB is executed.
Option ROM Messages	**Force BIOS** Keep Current	Set display mode for option ROMs.
INT19 Trap Response	**Immediate** Postponed	Set BIOS reaction on INT19 trapping by option ROM: 'Immediate' - Executes the trap right away. 'Postponed' - Executes the trap during legacy boot.
Boot Option Filter	**UEFI and Legacy** Legacy only UEFI only	This feature controls which devices/boot loaders the system should boot to.
Option ROM execution		
PXE Option ROM Launch Policy	Do not launch **UEFI ROM Only** Legacy ROM Only	This feature controls the execution of UEFI and legacy PXE option ROMs.
Storage Option ROM Launch Policy	Do not launch **UEFI ROM Only** Legacy ROM Only	This feature controls the execution of UEFI and legacy mass storage device option ROMs.
Video Option ROM Launch Policy	Do not launch UEFI ROM Only **Legacy ROM Only**	This feature controls the execution of UEFI and legacy video option ROMs.
Other Option ROM Launch Policy	Do not launch **UEFI ROM Only** Legacy ROM Only	This feature controls the execution of option ROMs for PCI / PCI Express devices other than network, mass storage and video.

8.4.23 NVMe Configuration Submenu

Settings are displayed if a NVMe device is connected.

8.4.24 SDIO Configuration Submenu

Settings are displayed if an SD Card is connected.

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8.4.25 Diagnostics Settings Submenu

Feature	Options	Description
POST Code Redirection Settings		
Relay Interface	**Disabled** I2C SMBus BC Diagnostics Console	Select the relay interface to which the POST code will be redirected.
Primary Port Addr. Lowbyte (Dec)	0-255 **(128)**	Set the address for the primary debug port. The usual address value is 0x80 (i.e. 128 dec lowbyte and 0 highbyte). However, any multiple of 8 is valid for a primary debug port address.
Primary Port Addr. Highbyte (Dec)	0-255 **(0)**	Set the address for the primary debug port. The usual address value is 0x80 (i.e. 128 dec lowbyte and 0 highbyte). However, any multiple of 8 is valid for a primary debug port address.
Relay Device Address (Dec)	0-255 **(226)**	Specify the I2C/SMBus device address of for example a 7-segment LCD for POST code display. The factory settings for the SparkFun device is 0xE2(226). However, any even device address can be specified.
BC Diagnostics Console Settings		
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.

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8.4.26 USB Submenu

Feature	Options	Description
USB Controllers	No option	Displays the number of enabled EHCI (USB2.0) and xHCI (USB3.0) controllers.
USB Devices	No option	Displays the detected USB devices.
Overcurrent Protection	**Disabled** Enabled	Disable or enable over-current protection on all USB ports.
Legacy USB Support	**Enabled** Disabled Auto	Disable this feature to keep USB devices available for EFI applications and BIOS setup only. Select 'Auto' to disable legacy support if no USB devices are connected.
xHCI Hand-off	**Enabled** Disabled	This feature is a workaround for operating system without xHCI hand-off support. **Note:** If this feature is enabled, the xHCI ownership change should be claimed by the xHCI operating system driver.
USB Mass Storage Driver Support	Disabled **Enabled**	Enable or disable USB mass storage driver support.
USB Transfer Timeout	1 sec 5 sec 10 sec **20 sec**	Select the timeout value for control, bulk, and interrupt transfers.
Device Reset Timeout	10 sec **20 sec** 30 sec 40 sec	Select the USB mass storage device Start Unit command timeout.
Device Power-up Delay Selection	**Auto** Manual	'Manual' - Set maximum time a USB device requires to report itself to the host controller. 'Auto' - Sets maximum time a USB device requires to report itself to the host controller to 100ms for a root port or derives the value from the hub descriptor of a hub port.
USB Mass Storage Device Name (Auto detected USB mass storage devices are listed here dynamically)	**Auto** Floppy Forced FDD Hard Disk CD-ROM	Select the emulation type for each USB mass storge device:[1] 'AUTO' - Lets the BIOS auto detect the current formatted media. 'Floppy' - Emulates the device as a floppy drive. 'Forced FDD' - Allows a HDD to be connected as a floppy image.[2] 'Hard Disk' - Allows the hard disk to be emulated as a HDD. 'CD-ROM' - Assumes the CD-ROM is formatted as a bootable media.[3] **Notes:** [1]The device's formatted type and the emulation type provided by the BIOS must match for the device to boot properly. [2]The drive must be formatted with FAT12, FAT16 or FAT32. [3]As specified by the 'El Torito' Format Specification

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8.4.27 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 beeps.
Output Device Debug Beeps	**Disabled** Enabled	Enable or disable output device debug beeps.
USB Driver Beeps	**Disabled** Enabled	Enable or disable USB driver beeps.

8.5 Chipset Setup

The description of this feature is beyond the scope of this document.

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	Enter password	Set the desired BIOS and setup administrator password.
BIOS Lock	Disabled **Enabled**	Enable or disable BIOS Lock Enable (BLE) and SMM BIOS Write Protect (SMM_BWP) bits. If enabled, BIOS flash write access is only possible via dedicated BIOS SMM interfaces.
BIOS Update & Write Protection	**Disabled** Enabled	If enabled, the congatec flash software will require the BIOS password to perform write or erase operations.
HDD Security Configuration	List of all detected hard disks supporting the security feature set	Select the device to open its security configuration submenu.
►Secure Boot Menu	Submenu	

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8.6.1.1 BIOS Security Features

BIOS Password/ BIOS Write Protection

A BIOS password protects the BIOS setup program from unauthorized access. This ensures that end users cannot change the system configuration without authorization. With an assigned BIOS password, the BIOS prompts the user for a password on a setup entry. If the password entered is wrong, the BIOS setup program will not launch.

The congatec BIOS uses a SHA256 based encryption for the password, which is more secured than the original AMI encryption. The BIOS password is case sensitive with a minimum of 3 characters and a maximum of 20 characters. Once a BIOS password has been assigned, the BIOS activates the disabled 'BIOS Update and Write Protection' option. If this option enabled, only authorized users (users with the correct password) can update the BIOS. To update the BIOS, use the congatec system utility cgutlcmd.exe with the following syntax:

```
CGUTLCMD BFLASH <BIOS file> /BP: <password> where <password> is the assigned BIOS password.
```

For more information about "Updating the BIOS" refer to the congatec system utility user's guide, which is called CGUTLm1x.pdf and can be found on the congatec AG website at www.congatec.com.

With the BIOS password protection and the BIOS update and write protection, the system configuration is completely secured. If the BIOS is password protected, you cannot change the configuration of an end application without the correct password.

Note

Use cgutlcmd.exe version 1.5.3 or later.

Built in BIOS recovery is disabled in the congatec BIOS firmware to prevent the BIOS from updating itself due to the user pressing a special key combination or a corrupt BIOS being detected. congatec considers such a recovery update a security risk because the BIOS internal update process bypasses the implemented BIOS security explained above.

Only the congatec utility interface to the SMI handler of the BIOS flash update is enabled. Other interfaces to the SMI handler are disabled to prevent non congatec tools from writing to the BIOS flash. Because of this restriction, flash utilities supplied by AMI or Intel will not work .

UEFI Secure Boot

Secure Boot is a security standard defined in UEFI specification 2.3.1 that helps prevent malicious software applications and unauthorized operating systems from loading during system start up process. Without secure boot enabled (not supported or disabled), the computer simply hands over control to the bootloader without checking whether it is a trusted operating system or malware. With secure boot supported and enabled, the UEFI firmware starts the bootloader only if the bootloader's signature has maintained integrity and also if one of the following conditions is true:

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- The bootloader was signed by a trusted authority that is registered in the UEFI database.
- The user has added the bootloader's digital signature to the UEFI database. The BIOS provides the key management setup sub-menu for this purpose.

Note

The congatec BIOS by default enables CSM (Compatibility Support Module) and disables secure boot because most of the industrial computers today boot in legacy (non-UEFI) mode. Since secure boot is only enabled when booting in native UEFI mode, you must therefore disable the CSM (compatibility support module) in the BIOS setup to enable Secure Boot.

A full description of secure boot is beyond the scope of this users guide. For more information about how secure boot leverages signature databases and keys, see the secure boot vverview in the windows deployment options section of the Microsoft TechNet Library at http://technet.microsoft.com.

8.6.1.2 Hard Disk Security Features

Hard Disk Security uses the Security Mode feature commands defined in the ATA specification. This functionality allows users to protect data using drive-level passwords. The passwords are kept within the drive, so data is protected even if the drive is moved to another computer system.

The BIOS provides the ability to 'lock' and 'unlock' drives using the security password. A 'locked' drive will be detected by the system, but no data can be accessed. Accessing data on a 'locked' drive requires the proper password to 'unlock' the disk.

The BIOS enables users to enable/disable hard disk security for each hard drive in setup. A master password is available if the user can not remember the user password. Both passwords can be set independently however the drive will only lock if a user password is installed. The max length of the passwords is 32 bytes.

During POST each hard drive is checked for security mode feature support. In case the drive supports the feature and it is locked, the BIOS prompts the user for the user password. If the user does not enter the correct user password within four attempts, the user is notified that the drive is locked and POST continues as normal. If the user enters the correct password, the drive is unlocked until the next reboot.

In order to ensure that the ATA security features are not compromised by viruses or malicious programs when the drive is typically unlocked, the BIOS disables the ATA security features at the end of POST to prevent their misuse. Without this protection it would be possible for viruses or malicious programs to set a password on a drive thereby blocking the user from accessing the data.

Note

If the user enables password support, a power cycle must occur for the hard drive to lock using the new password. Both user and master password can be set independently however the drive will only lock if a user password is installed.

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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
Quiet Boot	**Disabled** Enabled	Enable this feature to display OEM logo instead of POST messages. **Note:** The default OEM logo is a dark screen.
Setup Prompt Timeout	**1** (more values)	Set number of seconds to wait for a setup activation key: '65535' - Waits indefinitely (0xFFFF). '0' - Disables waiting (not recommended).
Bootup NumLock State	**On** Off	Set the keyboard numlock state.
Power Loss Control	Remain Off **Turn On** Last State	Set 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 power state before power loss occurred. **Note:** This feature only works with an ATX type power supply.
Enter Setup If No Boot Device	No **Yes**	Set whether the setup menu should be started if no boot device is connected.
Enable Popup Boot Menu	No **Yes**	Set whether the popup boot menu can be started.
Boot Priority Selection	UEFI Standard **Type Based**	'UEFI Based' - Select boot priority from a list of currently detected devices. 'Type Based' - Select 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: 'UEFI First' - Tries all UEFI boot options before first legacy boot option. 'Legacy First' Tries all Legacy boot options before first UEFI boot option.
1st, 2nd, 3rd, ... Boot Device (Up to 12 boot devices can be prioritized if "UEFI Standard" priority list control is selected. If "Type Based" priority list control is enabled only 8 boot devices can be prioritized.)	Disabled SATA 0 Drive SATA 1 Drive USB Harddisk USB CDROM Other USB Device Onboard SD Card Storage Onboard LAN External LAN Firmware-based Bootloader Other Device	This view is only available in the default "Type Based" mode. In "UEFI Standard" mode, you will only see the devices that are connected to the system.

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Feature	Options	Description
Battery Support	**Auto (Batt. Manager)** Battery-Only On I2C Bus Battery-Only On SMBus	'Battery-Only On I2C Bus' - Battery-only systems using I2C bus. 'Battery-Only On SMBus' - Battery-only systems using SMBus. 'Auto' - Real battery system manager systems using I2C or SMBus.
System Off Mode	**G3/Mech Off** S5/Soft Off	Set system state after shutdown if a battery system is present.
UEFI Fast Boot	**Disabled** Enabled	Enable to boot with a minimum set of devices. **Note:** This feature has no effect for BBS / legacy boot options.
SATA Support	Last Boot HDD Only **All SATA Devices**	Select SATA support.
USB Support	Disabled Full Init **Partial Init**	'Disabled' - The USB devices will not be available before operating system boot. 'Full Init' - All USB devices will be available during POST and after operating system boot. 'Partial Init' - Specific USB ports/devices will not be available before operating system boot.
Network Stack Driver Support	**Disabled** Enabled	Disable to skip the UEFI network stack driver installation.
Redirection Support	**Disabled** Enabled	Disable to deactivate the Redirection function.
UEFI Screenshot Capability	**Disabled** Enabled	Enable this feature to take a screenshots from the current screen by pressing LCtrl+LAlt+F12. The image will be saved as PNG on the first writable FAT32 partition found.

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 the standby voltage is not detected within 30 seconds, this is considered an AC power loss condition. If the standby voltage remains stable for 30 seconds, 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 with the <Arrow> keys to enter the Save & Exit setup screen.

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Feature	Description
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.
Restore Defaults	Restore default values for 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".

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9 Additional BIOS Features

The conga-IC170 uses a congatec/AMI AptioEFI that is stored in an onboard Flash Rom chip and can be updated using the congatec System Utility, which is available in a DOS based command line, Win32 command line, Win32 GUI, and Linux version.

The BIOS displays a message during POST and on the main setup screen identifying the BIOS project name and a revision code. The initial production BIOS is identified as IVSLR7xx or IUSLR7xx, where:

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

The IVSL binary size is 16 MB and the IUSL binary size is 8 MB.

9.1 Supported Flash Devices

The conga-IC170 supports the following flash devices:

- Winbond W25Q128FVSIG (16 MB)
- Winbond W25Q64CVSSIG (8 MB)

The flash devices listed above can be used on the carrier board for external BIOS support. 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.

9.2 Updating the BIOS

BIOS updates are often used by OEMs to correct platform issues discovered after the board has been shipped or when new features are added to the BIOS.

For more information about "Updating the BIOS" refer to the user's guide for the congatec System Utility, which is called CGUTLm1x.pdf and can be found on the congatec AG website at www.congatec.com.

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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
PICMG® COM Express Module™ Base Specification	http://www.picmg.org/
PCI Express Base Specification, Revision 2.0	http://www.pcisig.com/specifications

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