



# COM Express™ conga-TCA

*2nd Generation Dual Core Intel® Atom™ processor with an Intel® NM10 express chipset*

*User's Guide*

*Revision 1.0*

# Revision History

Revision	Date (yyyy.mm.dd)	Author	Changes
0.1	2012.08.27	AEM	<ul style="list-style-type: none"><li>• Preliminary release</li></ul>
0.2	2013.03.13	AEM	<ul style="list-style-type: none"><li>• Added Microsoft Windows 8 support in section 1.2 "Supported Operating System".</li><li>• Updated section 1.3 "Mechanical Dimension" and section 3 "Heatspreader" to reflect the actual heatspreader thickness of 4mm.</li><li>• Corrected the statement that the Intel® CG82NM10 (NM10) PCH found on the conga-TCA offers a single channel LVDS interface in section 4.1.10 "LCD".</li><li>• Updated section 4.1.14 "Power Control".</li><li>• Deleted the wake event signal "PME#" from section 6.4 "ACPI Suspend Modes and Resume Events" because this signal is not supported in COM Express type 6 specification.</li><li>• Updated section 9 "BIOS Setup Description".</li><li>• Added BIOS binary size in section 10 "Additional BIOS Features".</li><li>• Added section 10.1 "Supported Flash Devices".</li></ul>
1.0	2013.08.09	AEM	<ul style="list-style-type: none"><li>• Updated section 9 "BIOS Setup Description".</li><li>• Updated section 10.1 "Supported Flash Devices".</li><li>• Official release</li></ul>

# Preface

This user's guide provides information about the components, features, connectors and BIOS Setup menus available on the conga-TCA. It is one of three documents that should be referred to when designing a COM Express™ application. The other reference documents that should be used include the following:

COM Express™ Design Guide

COM Express™ Specification

The links to these documents can be found on the congatec AG website at [www.congatec.com](http://www.congatec.com)

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## Symbols

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



### Warning

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



### Caution

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



### Note

Notes call attention to important information that should be observed.

## Terminology

Term	Description
GB	Gigabyte (1,073,741,824 bytes)
GHz	Gigahertz (one billion hertz)
kB	Kilobyte (1024 bytes)
MB	Megabyte (1,048,576 bytes)
Mbit	Megabit (1,048,576 bits)
kHz	Kilohertz (one thousand hertz)
MHz	Megahertz (one million hertz)
TDP	Thermal Design Power
PCIe	PCI Express
SATA	Serial ATA
PEG	PCI Express Graphics
PCH	Platform Controller Hub
PATA	Parallel ATA
T.O.M.	Top of memory = max. DRAM installed
HDA	High Definition Audio
I/F	Interface
N.C.	Not connected
N.A.	Not available
TBD	To be determined

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## COM Express™ Concept

COM Express™ is an open industry standard defined specifically for COMs (computer on modules). Its creation provides the ability to make a smooth transition from legacy parallel interfaces to the newest technologies based on serial buses available today. COM Express™ modules are available in following form factors:

- Compact      95mm x 95mm
- Basic        125mm x 95mm
- Extended    155mm x 110mm

The COM Express™ specification 2.0 defines seven different pinout types.

Types	Connector Rows	PCI Express Lanes	PCI	IDE Channels	LAN ports
Type 1	A-B	Up to 6			1
Type 2	A-B C-D	Up to 22	32 bit	1	1
Type 3	A-B C-D	Up to 22	32 bit		3
Type 4	A-B C-D	Up to 32		1	1
Type 5	A-B C-D	Up to 32			3
Type 6	A-B C-D	Up to 24			1
Type 10	A-B	Up to 4			1

conga-TCA module utilize the Type 6 pinout definition. They are equipped with two high performance connectors that ensure stable data throughput.

The COM (computer on module) integrates all the core components and is mounted onto an application specific carrier board. COM modules are a legacy-free design (no Super I/O, PS/2 keyboard and mouse) and provide most of the functional requirements for any application. These functions include, but are not limited to, a rich complement of contemporary high bandwidth serial interfaces such as PCI Express, Serial ATA, USB 2.0, and Gigabit Ethernet. The Type 6 pinout provides the ability to offer PCI Express, Serial ATA, and LPC options thereby expanding the range of potential peripherals. The robust thermal and mechanical concept, combined with extended power-management capabilities, is perfectly suited for all applications.

Carrier board designers can utilize as little or as many of the I/O interfaces as deemed necessary. The carrier board can therefore provide all the interface connectors required to attach the system to the application specific peripherals. This versatility allows the designer to create a dense and optimized package, which results in a more reliable product while simplifying system integration. Most importantly, COM Express™ modules are scalable, which means once an application has been created there is the ability to diversify the product range through the use of different performance class or form factor size modules. Simply unplug one module and replace it with another, no redesign is necessary.

## Certification

congatec AG is certified to DIN EN ISO 9001 standard.



## Technical Support

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

## conga-TCA Options Information

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

### conga-TCA

Part-No.	047001	047002	047003	047004
<b>Processor</b>	Intel® Atom™ N2600 Dual Core 1.60 GHz	Intel® Atom™ N2800 Dual Core 1.86 GHz	Intel® Atom™ D2550 Dual Core 1.86 GHz	Intel® Atom™ D2550 (USB 3.0) Dual Core 1.86 GHz
<b>L2 Cache</b>	1 MByte	1 MByte	1 MByte	1 MByte
<b>PEG</b>	No	No	No	No
<b>SDVO</b>	No	No	No	No
<b>DisplayPort (DP)</b>	Yes	Yes	Yes	Yes
<b>HDMI</b>	Yes	Yes	Yes	Yes
<b>Processor TDP</b>	3.5 W	6.5 W	10 W	10 W



# Contents

1	Specifications .....	12	4.1.10	LCD .....	25
1.1	Feature List .....	12	4.1.11	SPI .....	25
1.2	Supported Operating Systems .....	13	4.1.12	General Purpose Serial Interface .....	25
1.3	Mechanical Dimensions .....	13	4.1.13	General Purpose Input/Output .....	25
1.4	Supply Voltage Standard Power .....	14	4.1.14	Power Control .....	26
1.4.1	Electrical Characteristics .....	14	4.1.15	Power Management .....	28
1.4.2	Rise Time .....	14	4.2	Secondary Connector Rows C and D .....	29
1.5	Power Consumption .....	15	4.2.1	USB 3.0 .....	29
1.5.1	conga-TCA Intel® Atom™ N2600 Dual Core 1.6 GHz 1MB Cache 16	16	4.2.2	HDMI .....	29
1.5.2	conga-TCA Intel® Atom™ N2800 Dual Core 1.86 GHz 1MB Cache 16	16	4.2.3	DisplayPort (DP) .....	29
1.5.3	conga-TCA Intel® Atom™ D2550 Dual Core 1.86 GHz 1MB Cache 17	17	5	Additional Features .....	30
1.5.4	conga-TCA Intel® Atom™ D2550 (USB 3.0) Dual Core 1.86 GHz 1MB Cache .....	17	5.1	congatec Board Controller (cBC) .....	30
1.6	Supply Voltage Battery Power .....	18	5.2	Board Information .....	30
1.6.1	CMOS Battery Power Consumption .....	18	5.3	Watchdog .....	30
1.7	Environmental Specifications .....	18	5.4	I²C Bus .....	30
2	Block Diagram .....	19	5.5	Power Loss Control .....	31
3	Heatspreader .....	20	5.6	Embedded BIOS .....	31
3.1	Heatspreader Dimensions .....	21	5.6.1	CMOS Backup in Non Volatile Memory .....	31
4	Connector Subsystems Rows A, B, C, D .....	22	5.6.2	OEM CMOS Default Settings and OEM BIOS Logo .....	31
4.1	Primary Connector Rows A and B .....	23	5.6.3	OEM BIOS Code .....	31
4.1.1	Serial ATA™ (SATA) .....	23	5.6.4	congatec Battery Management Interface .....	32
4.1.2	USB 2.0 .....	23	5.6.5	API Support (CGOS/EAPI) .....	32
4.1.3	High Definition Audio (HDA) Interface .....	23	5.7	Security Features .....	33
4.1.4	Gigabit Ethernet .....	23	5.8	Suspend to Ram .....	33
4.1.5	LPC Bus .....	24	6	conga Tech Notes .....	34
4.1.6	I²C Bus Fast mode .....	24	6.1	Intel® Matrix Storage Technology .....	34
4.1.7	PCI Express™ .....	24	6.1.1	AHCI .....	34
4.1.8	ExpressCard™ .....	24	6.2	Intel® Processor Features .....	34
4.1.9	Graphics Output (VGA/CRT) .....	24	6.2.1	Thermal Monitor and Catastrophic Thermal Protection .....	34
			6.2.2	Processor Performance Control .....	35
			6.3	Thermal Management .....	35
			6.4	ACPI Suspend Modes and Resume Events .....	37
			6.5	USB 2.0 EHCI Host Controller Support .....	38
			7	Signal Descriptions and Pinout Tables .....	39

7.1	A-B Connector Signal Descriptions.....	40	9.4.14	Console Redirection Submenu .....	85
7.2	A-B Connector Pinout .....	50	9.4.14.1	Console Redirection Settings Submenu .....	86
7.3	C-D Connector Signal Descriptions .....	52	9.4.14.2	Console Redirection Settings (EMS) Submenu .....	86
7.4	C-D Connector Pinout.....	62	9.4.15	Network Stack Submenu .....	87
7.5	Boot Strap Signals .....	64	9.5	Boot Setup .....	87
8	System Resources .....	65	9.5.1	Boot Settings Configuration .....	87
8.1	System Memory Map .....	65	9.5.1.1	CSM & Option ROM Parameters Submenu.....	89
8.2	I/O Address Assignment.....	65	9.6	Security Setup.....	90
8.2.1	LPC Bus.....	65	9.6.1	Security Settings .....	90
8.3	Interrupt Request (IRQ) Lines.....	66	9.6.1.1	Trusted Computing.....	90
8.4	PCI Configuration Space Map .....	68	9.6.2	Hard Disk Security .....	90
8.5	PCI Interrupt Routing Map .....	69	9.6.3	Save & Exit Menu .....	91
8.6	I <sup>2</sup> C Bus .....	69	10	Additional BIOS Features .....	92
8.7	SM Bus .....	69	10.1	Supported Flash Devices.....	92
9	BIOS Setup Description .....	70	10.2	Updating the BIOS .....	92
9.1	Entering the BIOS Setup Program.....	70	10.3	BIOS Security Features .....	92
9.1.1	Boot Selection Popup .....	70	10.4	Hard Disk Security Features .....	93
9.2	Setup Menu and Navigation.....	70	11	Industry Specifications .....	94
9.3	Main Setup Screen .....	71			
9.3.1	Intel RC Version Submenu.....	72			
9.4	Advanced Setup.....	72			
9.4.1	Graphics Submenu .....	73			
9.4.2	Watchdog Submenu.....	74			
9.4.3	Hardware Monitoring Submenu .....	76			
9.4.4	PCI Submenu.....	77			
9.4.4.1	PIRQ Routing & IRQ Reservation Submenu .....	78			
9.4.5	ACPI Submenu .....	78			
9.4.6	RTC Wake Settings Submenu .....	79			
9.4.7	CPU Submenu .....	79			
9.4.8	Memory Submenu.....	80			
9.4.9	Chipset Submenu .....	80			
9.4.9.1	IO Hub Devices Submenu .....	81			
9.4.9.2	PCI Express Port Submenu .....	82			
9.4.10	SATA Submenu .....	83			
9.4.11	iFFS Submenu .....	83			
9.4.12	USB Submenu .....	84			
9.4.13	Super I/O Submenu .....	85			

# List of Tables

Table 1	Feature Summary .....	12
Table 2	Signal Tables Terminology Descriptions .....	39
Table 3	Intel® High Definition Audio Link Signals Descriptions .....	40
Table 4	Gigabit Ethernet Signal Descriptions .....	41
Table 5	Serial ATA Signal Descriptions .....	42
Table 6	PCI Express Signal Descriptions (general purpose).....	43
Table 7	ExpressCard Support Pins Descriptions.....	44
Table 8	LPC Signal Descriptions .....	44
Table 9	USB Signal Descriptions.....	45
Table 10	CRT Signal Descriptions .....	45
Table 11	LVDS Signal Descriptions .....	46
Table 12	SPI BIOS Flash Interface Signal Descriptions .....	47
Table 13	Miscellaneous Signal Descriptions .....	47
Table 14	General Purpose I/O Signal Descriptions .....	48
Table 15	Power and System Management Signal Descriptions .....	48
Table 16	General Purpose Serial Interface Signal Descriptions.....	49
Table 17	Power and GND Signal Descriptions .....	49
Table 18	Connector A-B Pinout .....	50
Table 19	PCI Express Signal Descriptions (general purpose).....	52
Table 20	USB Signal Descriptions.....	52
Table 21	PCI Express Signal Descriptions (x16 Graphics).....	53
Table 22	DDI Signal Description.....	55
Table 23	HDMI Signal Descriptions .....	57
Table 24	DisplayPort (DP) Signal Descriptions .....	59
Table 25	Module Type Definition Signal Description .....	61
Table 26	Power and GND Signal Descriptions .....	61
Table 27	Connector C-D Pinout.....	62
Table 28	Boot Strap Signal Descriptions .....	64
Table 29	Memory Map .....	65
Table 30	IRQ Lines in PIC mode .....	66
Table 31	IRQ Lines in APIC mode .....	67
Table 32	PCI Configuration Space Map .....	68
Table 33	PCI Interrupt Routing Map .....	69

# 1 Specifications

## 1.1 Feature List

**Table 1 Feature Summary**

<b>Form Factor</b>	Based on COM Express™ standard pinout Type 6 Rev. 2.1 (Compact size 95 x 95mm)	
<b>Processor</b>	Intel® Atom™ N2600 Dual Core 1.60 GHz 1-MByte L2 Cache Intel® Atom™ N2800 Dual Core 1.86 GHz 1-MByte L2 Cache Intel® Atom™ D2550 Dual Core 1.86 GHz 1-MByte L2 Cache Intel® Atom™ D2550 (USB 3.0) Dual Core 1.86 GHz 1-MByte L2 Cache	
<b>Memory</b>	1 socket: SO-DIMM DDR3 up to 1066MT/s, maximum 4-GByte.	
<b>Chipset</b>	Intel® NM10 Express Chipset: Intel® CG82NM10 PCH	
<b>Audio</b>	HDA (High Definition Audio)/digital audio interface with support for multiple codecs	
<b>Ethernet</b>	Gigabit Ethernet: Realtek 8111E	
<b>Graphics Options</b>	Integrated graphics with OpenGL 3.0 and DirectX9 support. Two independent pipelines for full dual view support. <ul style="list-style-type: none"> <li>CRT Interface 350 MHz RAMDAC Resolutions up to 1920x1200 @ 60Hz</li> <li>Flat panel Interface (integrated) with 25-112MHz single-channel LVDS Transmitter. Supports: <ul style="list-style-type: none"> <li>Single-channel LVDS interface: 1 x 18 bpp (D2000/N2000 series) or 1 x 24 bpp (D2000 series only).</li> <li>VESA LVDS color mappings.</li> <li>Automatic Panel Detection via EPI (Embedded Panel Interface based on VESA EDID™ 1.3)</li> <li>Resolutions up to 1366x768 (WXGA) for 18 bpp and up to 1440x900 (WXGA+) for 24 bpp</li> </ul> </li> </ul>	
<b>Peripheral Interfaces</b>	<ul style="list-style-type: none"> <li>2x Serial ATA® II, with up to 3 Gb/s data transfer rate.</li> <li>Up to x5 PCI Express® Lanes if the optional USB 3.0 is not implemented. Each root port supports full 2.5 Gb/s bandwidth in each direction per x1 link</li> <li>8x USB 2.0 (UHCI and EHCI)</li> </ul>	<ul style="list-style-type: none"> <li>2x DDI (Digital Display Interface) with support for: <ul style="list-style-type: none"> <li>2x DisplayPort 1.1 on digital ports B and C. Multiplexed with HDMI/DVI ports. Supports hot plug detect.</li> <li>2x HDMI ports on digital ports B and C. Multiplexed with DP/DVI ports. Supports hot plug detect.</li> <li>2x DVI ports on digital ports B and C. Multiplexed with DP/HDMI ports. Supports hot plug detect.</li> </ul> </li> <li>2x USB 3.0</li> <li>LPC Bus</li> <li>I²C Bus, Fast Mode, multimaster</li> <li>SM Bus</li> </ul>
<b>BIOS</b>	AMI Aptio® UEFI 2.x firmware, 4MByte serial SPI with congatec Embedded BIOS features	
<b>Power Management</b>	ACPI 3.0 compliant with battery support. Also supports Suspend to RAM (S3).	



**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 8 of this user's guide to determine what options are available on your particular module.

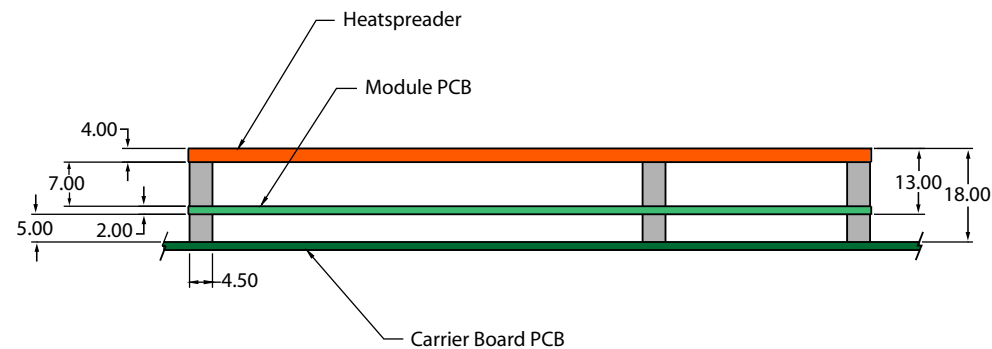
## 1.2 Supported Operating Systems

The conga-TCA supports the following operating systems.

- Microsoft® Windows® 8 (32 bit)
- Microsoft® Windows® 7
- Microsoft® Windows® XP
- Microsoft® Windows® Embedded Standard
- Linux

## 1.3 Mechanical Dimensions

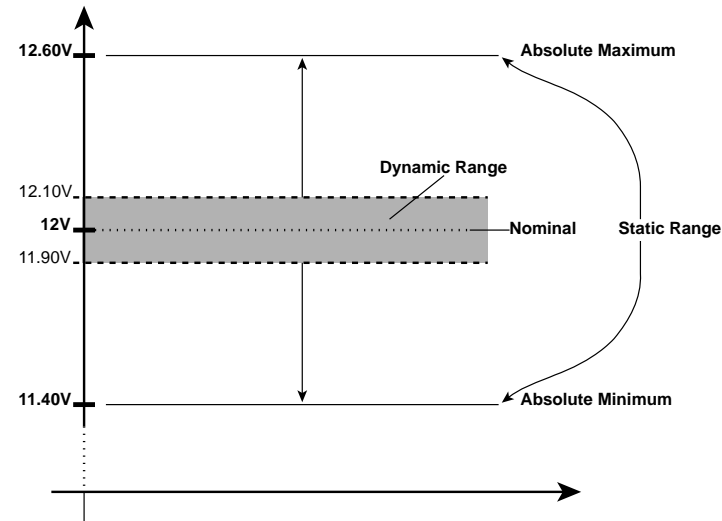
- 95.0 mm x 95.0 mm (3.75" x 3.75")
- Height approximately 18 or 21mm (including heatspreader) depending on the carrier board connector that is used. If the 5mm (height) carrier board connector is used then approximate overall height is 18mm. If the 8mm (height) carrier board connector is used then approximate overall height is 21mm.



## 1.4 Supply Voltage Standard Power

- 12V DC  $\pm$  5%

The dynamic range shall not exceed the static range.



### 1.4.1 Electrical Characteristics

Power supply pins on the module's connectors limit the amount of input power. The following table provides an overview of the limitations for pinout Type 6 (dual connector, 440 pins).

Power Rail	Module Pin Current Capability (Amps)	Nominal Input (Volts)	Input Range (Volts)	Derated Input (Volts)	Max. Input Ripple (10Hz to 20MHz) (mV)	Max. Module Input Power (w. derated input) (Watts)	Assumed Conversion Efficiency	Max. Load Power (Watts)
VCC_12V	12	12	11.4-12.6	11.4	+/- 100	137	85%	116
VCC_5V-SBY	2	5	4.75-5.25	4.75	+/- 50	9		
VCC_RTC	0.5	3	2.0-3.3		+/- 20			

### 1.4.2 Rise Time

The input voltages shall rise from 10% of nominal to 90% of nominal at a minimum rise time of 250V/s. The smooth turn-on requires that, during the 10% to 90% portion of the rise time, the slope of the turn-on waveform must be positive.

## 1.5 Power Consumption

The power consumption values listed in this document were measured under a controlled environment. The hardware used for testing includes a conga-TCA module, conga-Cdebug carrier board, CRT monitor, SATA drive, and USB keyboard. The conga-Cdebug is modified so that the 12V input is only routed to the module and all other circuitry on the carrier itself is powered by the 5V input. The SATA drive was powered externally by an ATX power supply so that it does not influence the power consumption value that is measured for the module. The USB keyboard was detached once the module was configured within the OS. All recorded values were averaged over a 30 second time period. Cooling of the module was done by the module specific heatspreader and a fan cooled heatsink to measure the power consumption under normal thermal conditions.

The conga-Cdebug originally does not provide 5V standby power. Therefore, an extra 5V\_SB connection without any external loads was made. Using this setup, the power consumption of the module in S3 (Standby) mode was measured directly.

Each module was measured while running Windows 7 Professional 32Bit, Hyper Threading enabled, Speed Step enabled and Power Plan set to "Power Saver". This setting ensures that Core™ processors run in LFM (lowest frequency mode) with minimal core voltage during desktop idle. Each module was tested while using a 1GB memory modules. Using different sizes of RAM will cause slight variances in the measured results.

To measure the worst case power consumption the cooling solution was removed and the CPU core temperature was allowed to run up to between 95° and 100°C while running 100% workload with the Power Plan set to "Balanced". The peak current value was then recorded. This value should be taken into consideration when designing the system's power supply to ensure that the power supply is sufficient during worst case scenarios.

Power consumption values were recorded during the following stages:

### Windows 7 (32 bit)

- Desktop Idle (power plan = Power Saver)
- 100% CPU workload (see note below, power plan = Power Saver)
- 100% CPU workload at approximately 100°C peak power consumption (power plan = Balanced)
- Suspend to RAM. Supply power for S3 mode is 5V.



*A software tool was used to stress the CPU to maximum frequency.*

## Processor Information

In the following power tables, there is some additional information about the processors.

Intel® describes the type of manufacturing process used for each processor. The following term is used:

nm=nanometer

The manufacturing process description is included in the power tables as well. See example below. For information about the manufacturing process visit Intel®'s website.

Intel® Atom™ N2600 1.6 GHz 1MB L2 Cache  
**32nm**

### 1.5.1 conga-TCA Intel® Atom™ N2600 Dual Core 1.6 GHz 1MB Cache

conga-TCA Art. No. 047001  Max Turbo Frequency Memory Size Operating System Power State	Intel® Atom™ N2600 1.6 GHz 1MB L2 Cache 32nm Layout Rev. TCEDLA0 /BIOS Rev. TCEDR006			
	Not supported			
	1GB			
	Windows 7 (32 bit)			
	Desktop Idle	100% workload	100% workload approx. 100°C CPU temp (peak)	Suspend to Ram (S3) 5V Input Power
Power consumption (measured in Amperes/Watts)	0.46 A/5.5 W (12V)	0.66 A/7.9 W (12V)	0.68 A/8.2 W (12V)	0.1 A/0.5 W (5V)

### 1.5.2 conga-TCA Intel® Atom™ N2800 Dual Core 1.86 GHz 1MB Cache

conga-TCA Art. No. 047002  Max Turbo Frequency Memory Size Operating System Power State	Intel® Atom™ N2800 1.86 GHz 1MB L2 Cache 32nm Layout Rev. TCEDLA0 /BIOS Rev. TCEDR006			
	Not supported			
	1GB			
	Windows 7 (32 bit)			
	Desktop Idle	100% workload	100% workload approx. 100°C CPU temp (peak)	Suspend to Ram (S3) 5V Input Power
Power consumption (measured in Amperes/Watts)	0.57 A/6.8 W (12V)	0.83 A/9.9 W (12V)	1.03 A/12.3 W (12V)	0.1 A/0.5 W (5V)



### 1.5.3 conga-TCA Intel® Atom™ D2550 Dual Core 1.86 GHz 1MB Cache

conga-TCA Art. No. 047003	Intel® Atom™ D2550 1.86 GHz 1MB L2 Cache 32nm Layout Rev. TCEDLA0 /BIOS Rev. TCEDR006			
Max Turbo Frequency	Not supported			
Memory Size	1GB			
Operating System	Windows 7 (32 bit)			
Power State	Desktop Idle	100% workload	100% workload approx. 100°C CPU temp (peak)	Suspend to Ram (S3) 5V Input Power
Power consumption (measured in Amperes/Watts)	0.67 A/8.0 W (12V)	0.97 A/11.6 W (12V)	1.07 A/12.8 W (12V)	0.1 A/0.5 W (5V)

### 1.5.4 conga-TCA Intel® Atom™ D2550 (USB 3.0) Dual Core 1.86 GHz 1MB Cache

conga-TS67 Art. No. 047004	Intel® Atom™ D2550 1.86 GHz 1MB L2 Cache 32nm Layout Rev. TCEDLA0 /BIOS Rev. TCEDR006			
Max Turbo Frequency	Not supported			
Memory Size	1GB			
Operating System	Windows 7 (32 bit)			
Power State	Desktop Idle	100% workload	100% workload approx. 100°C CPU temp (peak)	Suspend to Ram (S3) 5V Input Power
Power consumption (measured in Amperes/Watts)	0.7 A/8.4 W (12V)	1.0 A/11.9 W (12V)	1.2 A/14.6 W (12V)	0.1 A/0.5 W (5V)



**Note**

All recorded power consumption values are approximate and only valid for the controlled environment described earlier. 100% workload refers to the CPU workload and not the maximum workload of the complete module. Supply power for S3 mode is 5V while all other measured modes are supplied with 12V power. Power consumption results will vary depending on the workload of other components such as graphics engine, memory, etc.

## 1.6 Supply Voltage Battery Power

- 2.0V-3.5V DC
- Typical 3V DC

### 1.6.1 CMOS Battery Power Consumption

RTC @ 20°C	Voltage	Current
Integrated in the Intel® CG82NM10 PCH	3V DC	3.51 µA

The CMOS battery power consumption value listed above should not be used 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, which can be found on the congatec AG website at [www.congatec.com](http://www.congatec.com).

## 1.7 Environmental Specifications

Temperature	Operation: 0° to 60°C	Storage: -20° to +80°C
Humidity	Operation: 10% to 90%	Storage: 5% to 95%



### Caution

*The above operating temperatures must be strictly adhered to at all times. When using a heatspreader the maximum operating temperature refers to any measurable spot on the heatspreader's surface.*

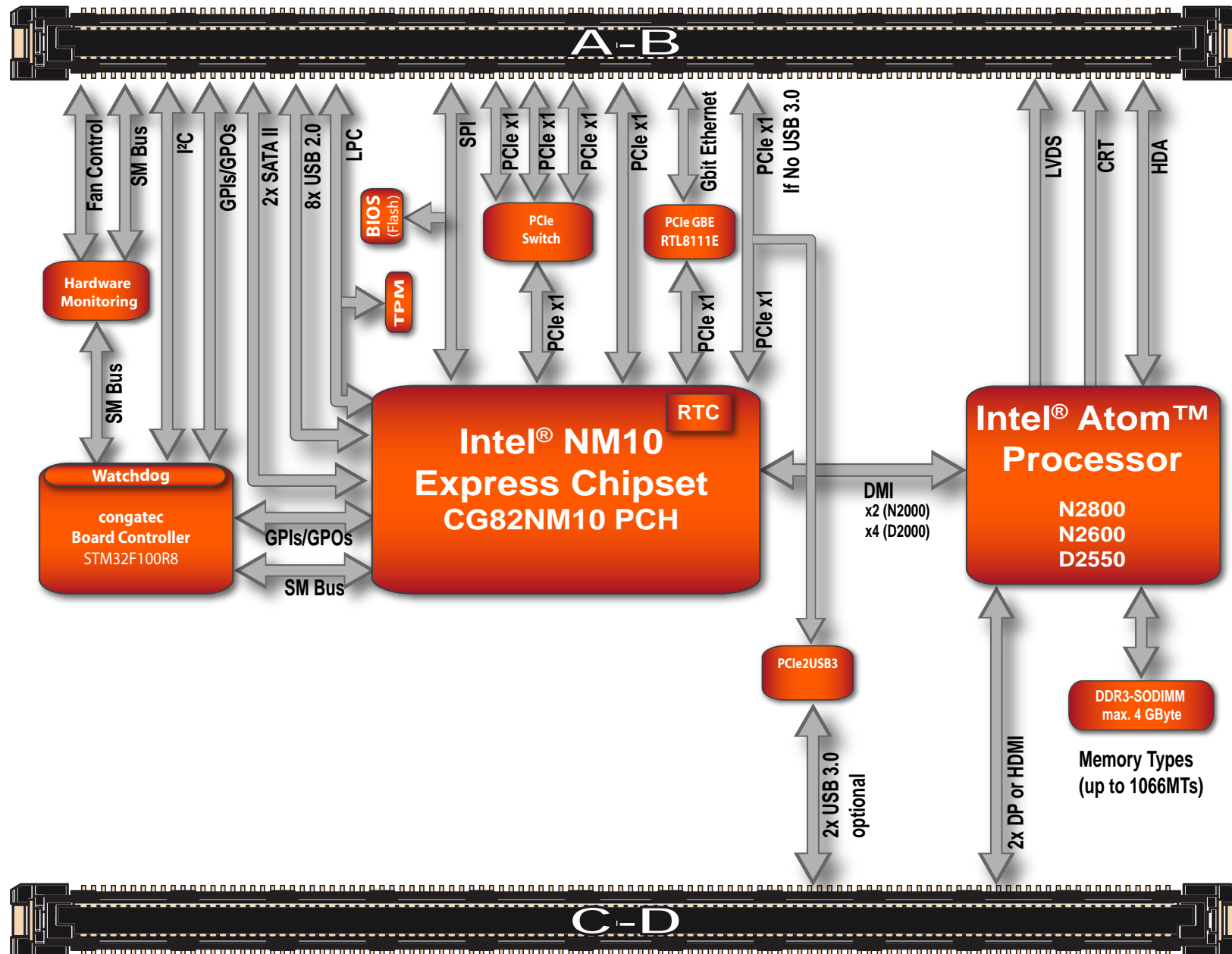
*congatec AG strongly recommends that you use the appropriate congatec module heatspreader as a thermal interface between the module and your application specific cooling solution.*

*If for some reason it is not possible to use the appropriate congatec module heatspreader, then it is the responsibility of the operator to ensure that all components found on the module operate within the component manufacturer's specified temperature range.*

*For more information about operating a congatec module without heatspreader contact congatec technical support.*

*Humidity specifications are for non-condensing conditions.*

## 2 Block Diagram



## 3 Heatspreader

An important factor for each system integration is the thermal design. The heatspreader acts as a thermal coupling device to the module and its aluminum plate is 4mm thick.

The heatspreader is thermally coupled to the CPU via a thermal gap filler and on some modules it may also be thermally coupled to other heat generating components with the use of additional thermal gap fillers.

Although the heatspreader is the thermal interface where most of the heat generated by the module is dissipated, it is not to be considered as a heatsink. It has been designed as a thermal interface between the module and the application specific thermal solution. The application specific thermal solution may use heatsinks with fans, and/or heat pipes, which can be attached to the heatspreader. Some thermal solutions may also require that the heatspreader is attached directly to the systems chassis thereby using the whole chassis as a heat dissipater.

For additional information about the conga-TCA heatspreader, refer to section 3.1 of this document.



### Caution

*There are mounting holes on the heatspreader designed to attach the heatspreader to the module. These mounting holes must be used to ensure that all components that are required to make contact with heatspreader do so. Failure to utilize these mounting holes will result in improper contact between these components and heatspreader thereby reducing heat dissipation efficiency.*

*Attention must be given to the mounting solution used to mount the heatspreader and module into the system chassis. Do not use a threaded heatspreader together with threaded carrier board standoffs. The combination of the two threads may be staggered, which could lead to stripping or cross-threading of the threads in either the standoffs of the heatspreader or carrier board.*

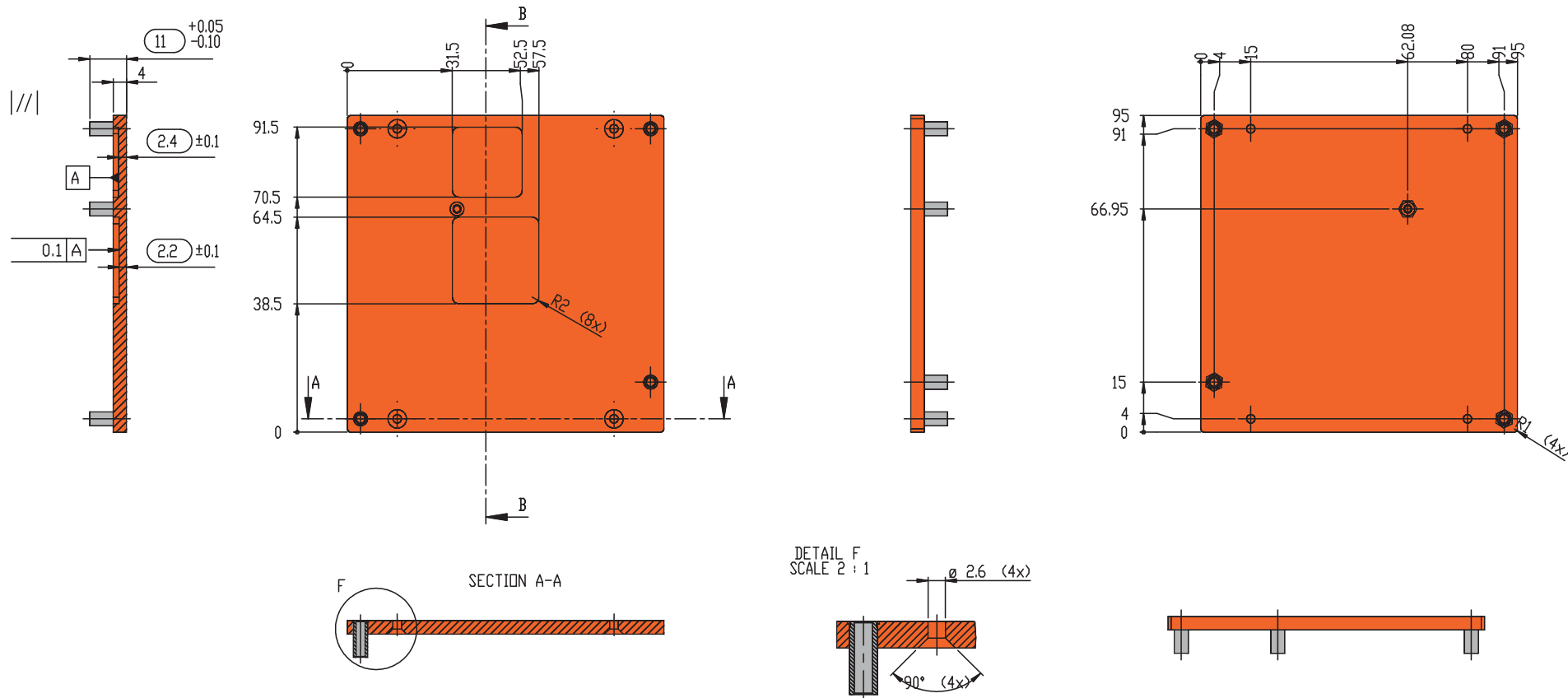


### Caution

*When using PN: 047003 conga-TCA/D2550 and/or PN: 047004 conga-TCA/D2550 xHCI modules in conjunction with the conga-TCA/CSP-T(B) passive cooling solution, active airflow must be provided over the cooling fins. The conga-TCA/CSP-T(B) is not capable of dissipating the heat generated by these modules without an active airflow present.*

## 3.1 Heatspreader Dimensions

SECTION B-B



### Note

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

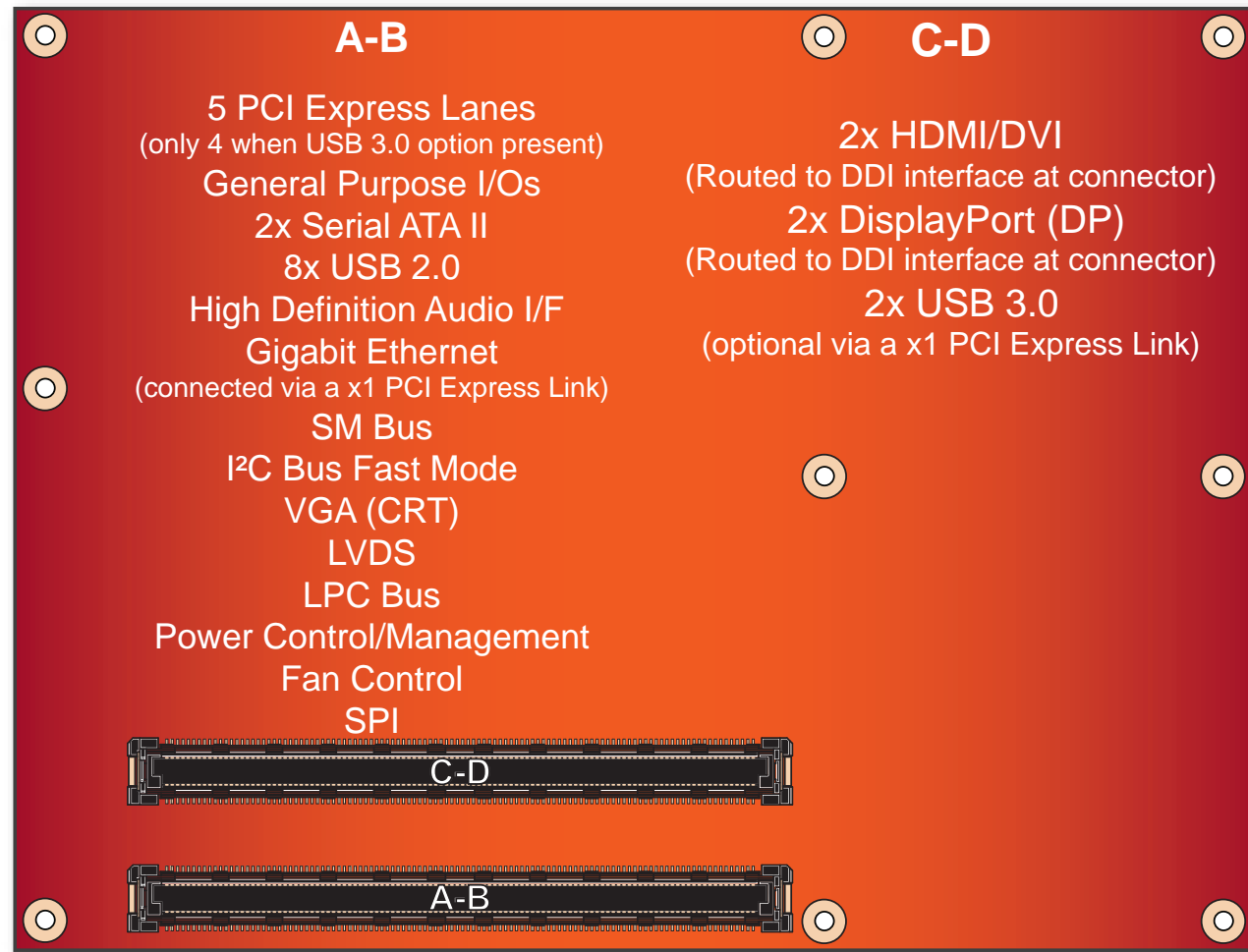
### Caution

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

## 4 Connector Subsystems Rows A, B, C, D

The conga-TCA is connected to the carrier board via two 220-pin connectors (COM Express Type 6 pinout) for a total of 440 pins connectivity. These connectors are broken down into four rows. The primary connector consists of rows A and B while the secondary connector consists of rows C and D.

In this view the connectors are seen “through” the module.



top view

## 4.1 Primary Connector Rows A and B

The following subsystems can be found on the primary connector rows A and B.

### 4.1.1 Serial ATA™ (SATA)

Two Serial ATA connections are provided via the Intel® CG82NM10 (NM10) PCH. These SATA ports are capable of up to 3.0 Gb/s transfer rate. The conga-TCA provides 2 SATA ports externally.

### 4.1.2 USB 2.0

The conga-TCA offers one EHCI USB host controller that supports USB high speed signalling and four UHCI host controllers that supports both low and full speed signalling through Intel® CG82NM10 (NM10) PCH. These controllers comply with USB standard 1.1 and 2.0 and offer a total of 8 USB ports via connector rows A and B. Each port is capable of supporting USB 1.1 and 2.0 compliant devices. For more information about how the USB host controllers are routed, see section 6.5.

### 4.1.3 High Definition Audio (HDA) Interface

The conga-TCA provides an interface that supports the connection of HDA audio codecs.

### 4.1.4 Gigabit Ethernet

The conga-TCA offers Gigabit Ethernet with the integration of Realtek RTL8111E Gigabit Ethernet Controller. This controller is implemented through the use of one PCI Express lane, and runs at a 1.25GHz signalling rate with x1 link width. The Ethernet interface consists of 4 pairs of low voltage differential pair signals designated from MDI0<sub>±</sub> to MDI3<sub>±</sub> plus three LED signals for link activity indicators. These signals can be used to connect to a 10/100/1000 BaseT RJ45 connector with integrated or external isolation magnetics on the carrier board.



#### Note

*The GBE0\_LINK# output is only active during a 100Mbit or 1Gbit connection, it is not active during a 10Mbit connection. This is a limitation of Ethernet controller since it only has 3 LED outputs, ACT#, LINK100# and LINK1000#. The GBE0\_LINK# signal is a logic AND of the GBE0\_LINK100# and GBE0\_LINK1000# signals on the conga-TCA module.*

## **4.1.5 LPC Bus**

conga-TCA offers the LPC (Low Pin Count) bus through the use of the Intel® CG82NM10 (NM10) PCH. There are many devices available for this Intel® defined bus. The LPC bus corresponds approximately to a serialized ISA bus yet with a significantly reduced number of signals. Due to the software compatibility to the ISA bus, I/O extensions such as additional serial ports can be easily implemented on an application specific baseboard using this bus. See section 8.2.1 for more information about the LPC Bus.

## **4.1.6 I²C Bus Fast mode**

The I²C bus is implemented through the congatec board controller (STMicroelectronics STM32). It provides a Fast Mode multi-master I²C Bus that has maximum I²C bandwidth.

## **4.1.7 PCI Express™**

The Intel® CG82NM10 (NM10) PCH chipset featured on the conga-TCA offers four PCI Express™ lanes. Through the use of a PCIe switch, the conga-TCA provides up to five external PCI Express™ lanes if the optional USB 3.0 is not implemented. The Gen1 PCI Express™ interface offers support for full 2.5 Gb/s bandwidth in each direction per x1 link. The conga-TCA also has a sixth PCI Express™ lane that is utilized by the onboard Gigabit Ethernet interface and therefore not available externally.

The five external PCI Express™ lanes are available on the A,B connector row. The PCI Express interface is based on the PCI Express Specification 1.0a (Gen 1 supporting up to 2.5 Gb/s transfer rate).

## **4.1.8 ExpressCard™**

The conga-TCA supports the implementation of ExpressCards, which requires the dedication of one USB port and a x1 PCI Express link for each ExpressCard used.

## **4.1.9 Graphics Output (VGA/CRT)**

The conga-TCA graphics are incorporated within the processor found on the conga-TCA. The processor contains an integrated graphics engine, video decode and a display controller that supports DirectX 9.0, OGL 3.0. It also offers two display pipes that supports dual independent displays.



#### 4.1.10 LCD

The Intel® Atom™ D2000/N2000 series processors on the conga-TCA offers a single channel LVDS interface. There is one LVDS transmitter channel in the LVDS interface and it consists of 4-data pairs and a clock pair each. The LVDS data pair is used to transfer pixel data as well as the LCD timing control signals.

The N2000 series CPUs found on the conga-TCA support 1x18 bpp only. The D2000 series support both 1x18 bpp and 1x24 bpp.

#### 4.1.11 SPI

A SPI interface that supports booting from an external SPI flash is available on the conga-TCA via the Intel® CG82NM10 (NM10) PCH . The Intel® CG82NM10 (NM10) PCH implements a SPI interface as an alternative interface for the BIOS flash device. A SPI flash device can be used as a replacement for the Firmware Hub

#### 4.1.12 General Purpose Serial Interface

Two TTL compatible two wire ports are available on Type 6 COM Express modules. These pins are designated SER0\_TX, SER0\_RX, SER1\_TX and SER1\_RX. Data out of the module is on the \_TX pins. Hardware handshaking and hardware flow control are not supported. The module asynchronous serial ports are intended for general purpose use and for use with debugging software that make use of the “console redirect” features available in many operating systems.



##### **Note**

*The General Purpose Serial Interface is not supported on the conga-TCA module.*

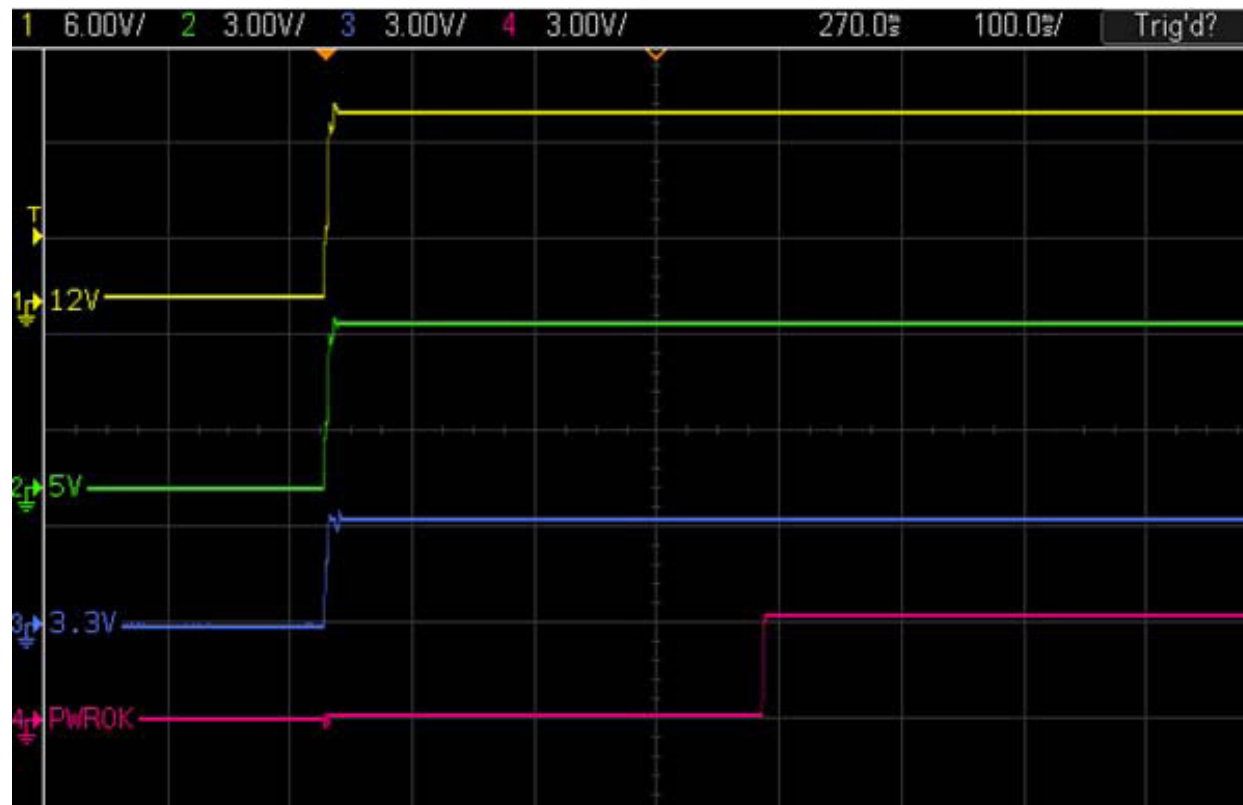
#### 4.1.13 General Purpose Input/Output

The conga-TCA provides various general purpose inputs and outputs for custom system design. These GPIOs are provided via Intel® CG82NM10 (NM10) and routed to the A,B connector through the congatec Board Controller (STM32F100R8).

## 4.1.14 Power Control

### PWR\_OK

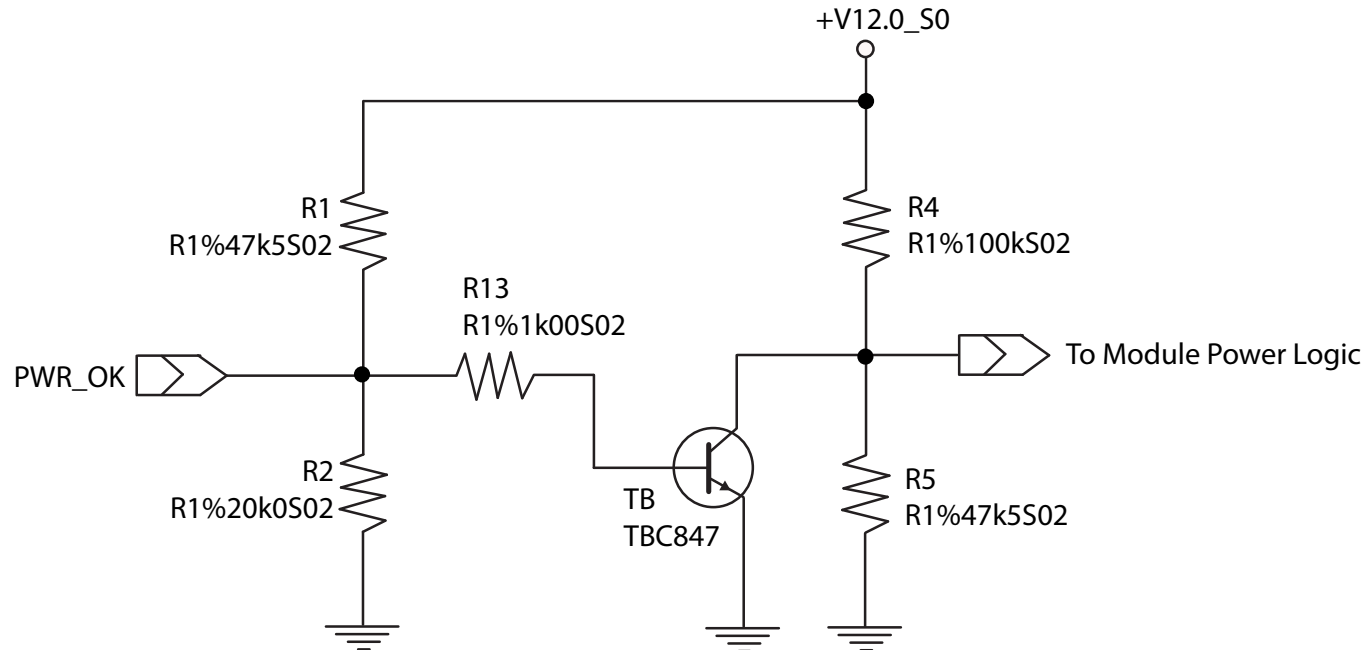
Power OK from main power supply or carrier board voltage regulator circuitry. A high value indicates that the power is good and the module can start its onboard power sequencing. Carrier board hardware must drive this signal low until all power rails and clocks are stable. Releasing PWR\_OK too early or not driving it low at all can cause numerous boot up problems. It is a good design practice to delay the PWR\_OK signal a little (typically 100ms) after all carrier board power rails are up, to ensure a stable system. See screenshot below.



#### Note

*The module is kept in reset as long as the PWR\_OK is driven by carrier board hardware.*

The conga-TCA PWR\_OK input circuitry is implemented as shown below:



The voltage divider ensures that the input complies with 3.3V CMOS characteristic and also allows for carrier board designs that are not driving PWR\_OK. Although the PWR\_OK input is not mandatory for the onboard power-up sequencing, it is strongly recommended that the carrier board hardware drives the signal low until it is safe to let the module boot-up.

When considering the above shown voltage divider circuitry and the transistor stage, the voltage measured at the PWR\_OK input pin may be only around 0.8V when the 12V is applied to the module. Actively driving PWR\_OK high is compliant to the COM Express specification but this can cause back driving. Therefore, congatec recommends driving the PWR\_OK low to keep the module in reset and tri-state PWR\_OK when the carrier board hardware is ready to boot.

The three typical usage scenarios for a carrier board design are:

- Connect PWR\_OK to the “power good” signal of an ATX type power supply.
- Connect PWR\_OK to the last voltage regulator in the chain on the carrier board.
- Simply pull PWR\_OK with a 1k resistor to the carrier board 3.3V power rail.

With this solution, it must be ensured that by the time the 3.3V is up, all carrier board hardware is fully powered and all clocks are stable.

The conga-TCA provides support for controlling ATX-style power supplies. When not using an ATX power supply then the conga-TCA's pins SUS\_S3/PS\_ON, 5V\_SB, and PWRBTN# should be left unconnected.

### **SUS\_S3#/PS\_ON#**

The SUS\_S3#/PS\_ON# (pin A15 on the A-B connector) signal is an active-low output that can be used to turn on the main outputs of an ATX-style power supply. In order to accomplish this the signal must be inverted with an inverter/transistor that is supplied by standby voltage and is located on the carrier board.

### **PWRBTN#**

When using ATX-style power supplies PWRBTN# (pin B12 on the A-B connector) is used to connect to a momentary-contact, active-low debounced push-button input while the other terminal on the push-button must be connected to ground. This signal is internally pulled up to 3V\_SB using a 10k resistor. When PWRBTN# is asserted it indicates that an operator wants to turn the power on or off. The response to this signal from the system may vary as a result of modifications made in BIOS settings or by system software.

## **Power Supply Implementation Guidelines**

12 volt input power is the sole operational power source for the conga-TCA. The remaining necessary voltages are internally generated on the module using onboard voltage regulators. A carrier board designer should be aware of the following important information when designing a power supply for a conga-TCA application:

- It has also been noticed that on some occasions, problems occur when using a 12V power supply that produces non monotonic voltage when powered up. The problem is that some internal circuits on the module (e.g. clock-generator chips) will generate their own reset signals when the supply voltage exceeds a certain voltage threshold. A voltage dip after passing this threshold may lead to these circuits becoming confused resulting in a malfunction. It must be mentioned that this problem is quite rare but has been observed in some mobile power supply applications. The best way to ensure that this problem is not encountered is to observe the power supply rise waveform through the use of an oscilloscope to determine if the rise is indeed monotonic and does not have any dips. This should be done during the power supply qualification phase therefore ensuring that the above mentioned problem doesn't arise in the application. For more information about this issue visit [www.formfactors.org](http://www.formfactors.org) and view page 25 figure 7 of the document "ATX12V Power Supply Design Guide V2.2".

### **4.1.15 Power Management**

ACPI 3.0 compliant with battery support. Also supports Suspend to RAM (S3).

## 4.2 Secondary Connector Rows C and D

The following subsystems can be found on the secondary connector rows C and D.

### 4.2.1 USB 3.0

The conga-TCA offers two USB 3.0 ports with the integration of a USB 3.0 xHCI compliant host controller (Texas Instrument TUSB7320). This controller is implemented through the use of one PCI Express™ lane and provides SuperSpeed, high-speed, full-speed and low-speed traffic on the bus.



*The USB 3.0 is an optional feature.*

### 4.2.2 HDMI

The Intel® Atom™ D2000/N2000 series processors on the conga-TCA supports integrated HDMI, which is multiplexed onto the Digital Display Interface (DDI) of the COM Express connector. The processor provides two ports capable of supporting HDMI. See section 7.5 of this document for more information about enabling HDMI peripherals.

### 4.2.3 DisplayPort (DP)

The conga-TCA offers two DP ports, each capable of supporting link-speeds of 1.62 Gbps and 2.7 Gbps on 1, 2 or 4 data lanes. The DP is multiplexed onto the Digital Display Interface (DDI) of the COM Express connector. The DisplayPort specification is a VESA standard aimed at consolidating internal and external connection methods to reduce device complexity, supporting key cross industry applications, and providing performance scalability to enable the next generation of displays. The Intel® Atom™ D2000/N2000 series processors can support a maximum of 2 DP ports simultaneously. See section 7.5 of this document for more information about enabling DisplayPort peripherals.

## 5 Additional Features

### 5.1 congatec Board Controller (cBC)

The conga-TCA is equipped with a STMicroelectronics STM32 microcontroller. This onboard microcontroller plays an important role for most of the congatec embedded/industrial PC features. It fully isolates some of the embedded features such as system monitoring or the I<sup>2</sup>C 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. It also ensures that the congatec embedded feature set is fully compatible amongst all congatec modules.

### 5.2 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.

### 5.3 Watchdog

The conga-TCA is equipped with a multi stage watchdog solution that is triggered by software. The COM Express™ Specification does not provide support for external hardware triggering of the Watchdog, which means the conga-TCA does not support external hardware triggering. For more information about the Watchdog feature see the BIOS setup description section 9.4.2 of this document and application note AN3\_Watchdog.pdf on the congatec AG website at [www.congatec.com](http://www.congatec.com).



#### Note

*The conga-TCA module does not support the watchdog NMI mode. COM Express type 6 modules do not support the PCI bus and therefore the PCI\_SERR# signal is not available. There is no way to drive a NMI to the processor without the presence of the PCI\_SERR# PCI bus signal.*

### 5.4 I<sup>2</sup>C Bus

The conga-TCA offers support for the frequently used I<sup>2</sup>C bus. Thanks to the I<sup>2</sup>C host controller in the cBC the I<sup>2</sup>C bus is multimaster capable and runs at fast mode.

## **5.5 Power Loss Control**

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

## **5.6 Embedded BIOS**

The conga-TCA is equipped with congatec Embedded BIOS, which is based on American Megatrends Inc. Aptio UEFI firmware. These are the most important embedded PC features:

### **5.6.1 CMOS Backup in Non Volatile Memory**

A copy of the CMOS memory (SRAM) is stored in the BIOS flash device. This prevents the system from not booting up with the correct system configuration if the backup battery (RTC battery) has failed. Additionally, it provides the ability to create systems that do not require a CMOS backup battery.

### **5.6.2 OEM CMOS Default Settings and OEM BIOS Logo**

This feature allows system designers to create and store their own CMOS 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 CGUITL.

### **5.6.3 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 Win XP SLP installation, 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, which is called CGUTLm1x.pdf and can be found on the congatec AG website at [www.congatec.com](http://www.congatec.com) or contact congatec technical support.

## 5.6.4 congatec Battery Management Interface

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

The conga-TCA 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<sup>3</sup> User's Guide

## 5.6.5 API Support (CGOS/EAPI)

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

Other COM (Computer on Modules) vendors offer similar driver solutions for these kind of embedded PC features, which are by nature proprietary. All the API solutions that can be found on the market are not compatible to each other. As a result, writing application software that can run on more than one vendor's COM is not so easy. Customers have to change their application software when switching to another COM vendor. EAPI (Embedded Application Programming Interface) is a programming interface defined by the PICMG that addresses this problem. With this unified API, it is now possible to run the same application on all vendor's COMs that offer EAPI driver support. Contact congatec technical support for more information about EAPI.



## 5.7 Security Features

The conga-TCA can be equipped optionally with a “Trusted Platform Module” (TPM 1.2). This TPM 1.2 includes coprocessors to calculate efficient hash and RSA algorithms with key lengths up to 2,048 bits as well as a real random number generator. Security sensitive applications like gaming and e-commerce will benefit also with improved authentication, integrity and confidence levels.

## 5.8 Suspend to Ram

The Suspend to RAM feature is available on the conga-TCA.

## 6 conga Tech Notes

The conga-TCA has some technological features that require additional explanation. The following section will give the reader a better understanding of some of these features. This information will also help to gain a better understanding of the information found in the System Resources section of this user's guide as well as some of the setup nodes found in the BIOS Setup Program description section.

### 6.1 Intel® Matrix Storage Technology

The Intel® CG82NM10 (NM10) PCH provides support for Intel® Matrix Storage Technology, allowing AHCI functionality.

#### 6.1.1 AHCI

The Intel® CG82NM10 (NM10) PCH provides hardware support for Advanced Host Controller Interface (AHCI), a new programming interface for SATA host controllers. Platforms supporting AHCI may take advantage of performance features such as no master/slave designation for SATA devices (each device is treated as a master) and hardware-assisted native command queuing. AHCI also provides usability enhancements such as Hot-Plug.

### 6.2 Intel® Processor Features

#### 6.2.1 Thermal Monitor and Catastrophic Thermal Protection

Intel® Atom™ D2000/N2000 series processors have a thermal monitor feature that helps to control the processor temperature. The integrated TCC (Thermal Control Circuit) activates if the processor silicon reaches its maximum operating temperature. The activation temperature, that the Intel® Thermal Monitor uses to activate the TCC, cannot be configured by the user nor is it software visible.

The Thermal Monitor can control the processor temperature through the use of two different methods defined as TM1 and TM2. TM1 method consists of the modulation (starting and stopping) of the processor clocks at a 50% duty cycle. The TM2 method initiates an Enhanced Intel Speedstep transition to the lowest performance state once the processor silicon reaches the maximum operating temperature.



*The maximum operating temperature for Intel® Atom™ D2000/N2000 series processors is 100°C.*

Two modes are supported by the Thermal Monitor to activate the TCC. They are called Automatic and On-Demand. No additional hardware, software, or handling routines are necessary when using Automatic Mode.

**Note**

*To ensure that the TCC is active for only short periods of time, thus reducing the impact on processor performance to a minimum, it is necessary to have a properly designed thermal solution. The Intel® Atom™ D2000/N2000 series processor's respective datasheet can provide you with more information about this subject.*

THERMTRIP# signal is used by Intel®'s Atom™ D2000/N2000 series processors for catastrophic thermal protection. If the processor's silicon reaches a temperature of approximately 125°C then the processor signal THERMTRIP# will go active and the system will automatically shut down to prevent any damage to the processor as a result of overheating. The THERMTRIP# signal activation is completely independent from processor activity and therefore does not produce any bus cycles.

**Note**

*In order for THERMTRIP# to be able to automatically switch off the system, it is necessary to use an ATX style power supply.*

## 6.2.2 Processor Performance Control

Intel® Atom™ D2000/N2000 series processors found on the conga-TCA run at different voltage/frequency states (performance states), which is referred to as Enhanced Intel® SpeedStep® technology (EIST). Operating systems that support performance control take advantage of microprocessors that use several different performance states in order to efficiently operate the processor when it's not being fully utilized. The operating system will determine the necessary performance state that the processor should run at so that the optimal balance between performance and power consumption can be achieved during runtime.

The Windows family of operating systems links its processor performance control policy to the power scheme setting. You must ensure that your power scheme setting you choose has the ability to support Enhanced Intel® SpeedStep® technology.

## 6.3 Thermal Management

ACPI is responsible for allowing the operating system to play an important part in the system's thermal management. This results in the operating system having the ability to take control of the operating environment by implementing cooling decisions according to the demands put on the CPU by the application.

The conga-TCA ACPI thermal solution offers three different cooling policies.

- **Passive Cooling**

When the temperature in the thermal zone must be reduced, the operating system can decrease the power consumption of the processor by throttling the processor clock. One of the advantages of this cooling policy is that passive cooling devices (in this case the processor) do not

produce any noise. Use the “passive cooling trip point” setup node in the BIOS setup program to determine the temperature threshold that the operating system will use to start or stop the passive cooling procedure.

- **Active Cooling**

During this cooling policy the operating system is turning the fan on/off. Although active cooling devices consume power and produce noise, they also have the ability to cool the thermal zone without having to reduce the overall system performance. Use the “active cooling trip point” setup node in the BIOS setup program to determine the temperature threshold that the operating system will use to start the active cooling device. It is stopped again when the temperature goes below the threshold (4°C hysteresis).

- **Critical Trip Point**

If the temperature in the thermal zone reaches a critical point then the operating system will perform a system shut down in an orderly fashion in order to ensure that there is no damage done to the system as result of high temperatures. Use the “critical trip point” setup node in the BIOS setup program to determine the temperature threshold that the operating system will use to shut down the system.



**Note**

*The end user must determine the cooling preferences for the system by using the setup nodes in the BIOS setup program to establish the appropriate trip points.*

*If passive cooling is activated and the processor temperature is above the trip point the processor clock is throttled according to the formula below.*

$$\Delta P[\%] = TC1(T_n - T_{n-1}) + TC2(T_n - T_t)$$

- $\Delta P$  is the performance delta
- $T_t$  is the target temperature = critical trip point
- The two coefficients TC1 and TC2 and the sampling period TSP are hardware dependent constants. These constants are set to fixed values for the conga-TCA:
- TC1= 1
- TC2= 5
- TSP= 5 seconds

*See section 12 of the ACPI Specification 2.0 C for more information about passive cooling.*

## 6.4 ACPI Suspend Modes and Resume Events

conga-TCA supports S3 (STR= Suspend to RAM). For more information about S3 wake events see section 9.4.5 “ACPI Submenu”.

S4 (Suspend to Disk) is not supported by the BIOS (S4\_BIOS) but it is supported by the following operating systems (S4\_OS= Hibernate):

- Windows 7, Windows Vista, Linux, Windows XP and Windows 2K

This table lists the “Wake Events” that resume the system from S3 unless otherwise stated in the “Conditions/Remarks” column:

Wake Event	Conditions/Remarks
Power Button	Wakes unconditionally from S3-S5.
Onboard LAN Event	Device driver must be configured for Wake On LAN support.
SMBALERT#	Wakes unconditionally from S3-S5.
PCI Express WAKE#	Wakes unconditionally from S3-S5.
USB Mouse/Keyboard Event	<p>When Standby mode is set to S3, the following must be done for a USB Mouse/Keyboard Event to be used as a Wake Event.</p> <p>USB Hardware must be powered by standby power source.</p> <p>Set USB Device Wakeup from S3/S4 to ENABLED in the ACPI setup menu (if setup node is available in BIOS setup program).</p> <p>Under Windows XP add following registry entries:</p> <p>Add this key:            HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\usb</p> <p>Under this key add the following value:            “USBBIOSx”=DWORD:00000000</p> <p><i>Note that Windows XP disables USB wakeup from S3, so this entry has to be added to re-enable it.</i></p> <p>Configure USB keyboard/mouse to be able to wake up the system:</p> <p>In Device Manager look for the keyboard/mouse devices. Go to the Power Management tab and check ‘Allow this device to bring the computer out of standby’.</p> <p><i>Note: When the standby state is set to S3 in the ACPI setup menu, the power management tab for USB keyboard /mouse devices only becomes available after adding the above registry entry and rebooting to allow the registry changes to take affect.</i></p>
RTC Alarm	Activate and configure Resume On RTC Alarm in the Power setup menu. Only available in S5.
Watchdog Power Button Event	Wakes unconditionally from S3-S5.

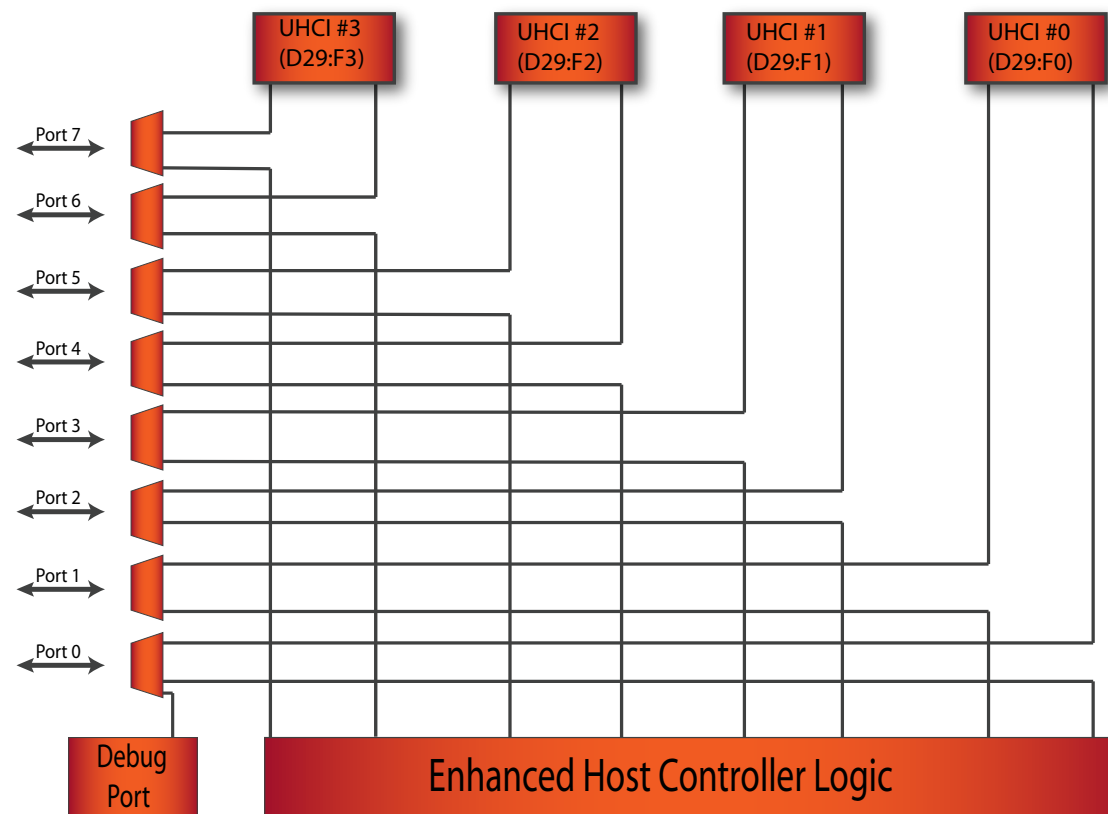
## 6.5 USB 2.0 EHCI Host Controller Support

The Intel® CG82NM10 (NM10) PCH supports up to eight USB ports. The 8 available USB ports are shared between 1 EHCI host controller and the 4 UHCI host controllers.

The muxing between the UHCI and EHCI host controllers is performed by the port-routing logic integrated into the EHC functionality. If a device not capable of USB 2.0 high-speed signalling is connected or if the EHCI software drivers are not present, then the UHCI controller owns the port. Owning the port means that the differential output is driven by the owner and the input stream is only visible to the owner. The host controller that is not the owner of the port internally sees a disconnected port.

The Intel® CG82NM10 (NM10) PCH allows the USB Debug Port traffic to be routed in and out of Port 0. When in this mode, the Enhanced Host controller is the owner of Port 0.

### Routing Diagram



# 7 Signal Descriptions and Pinout Tables

The following section describes the signals found on COM Express™ Type VI connectors used for congatec AG modules. The pinout of the modules complies with COM Express Type 6.0 Rev. 2.1.

Table 2 describes the terminology used in this section for the Signal Description tables. The PU/PD column indicates if a COM Express™ module pull-up or pull-down resistor has been used, if the field entry area in this column for the signal is empty, then no pull-up or pull-down resistor has been implemented by congatec.

The “#” symbol at the end of the signal name indicates that the active or asserted state occurs when the signal is at a low voltage level. When “#” is not present, the signal is asserted when at a high voltage level.



## Note

*The Signal Description tables do not list internal pull-ups or pull-downs implemented by the chip vendors, only pull-ups or pull-downs implemented by congatec are listed. For information about the internal pull-ups or pull-downs implemented by the chip vendors, refer to the respective chip's datasheet.*

**Table 2 Signal Tables Terminology Descriptions**

Term	Description
PU	congatec implemented pull-up resistor
PD	congatec implemented pull-down resistor
I/O 3.3V	Bi-directional signal 3.3V tolerant
I/O 5V	Bi-directional signal 5V tolerant
I 3.3V	Input 3.3V tolerant
I 5V	Input 5V tolerant
I/O 3.3VSB	Input 3.3V tolerant active in standby state
O 3.3V	Output 3.3V signal level
O 5V	Output 5V signal level
OD	Open drain output
P	Power Input/Output
DDC	Display Data Channel
PCIE	In compliance with PCI Express Base Specification, Revision 1.0a
PEG	PCI Express Graphics
SATA	In compliance with Serial ATA specification, Revision 3.0.
REF	Reference voltage output. May be sourced from a module power plane.
PDS	Pull-down strap. A module output pin that is either tied to GND or is not connected. Used to signal module capabilities (pinout type) to the Carrier Board.

## 7.1 A-B Connector Signal Descriptions

**Table 3 Intel® High Definition Audio Link Signals Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
AC/HDA_RST#	A30	<b>Intel® High Definition Audio Reset:</b> This signal is the master hardware reset to external codec(s).	O 3.3VSB		AC'97 codecs are not supported.
AC/HDA_SYNC	A29	<b>Intel® High Definition Audio Sync:</b> This signal is a 48 kHz fixed rate sample sync to the codec(s). It is also used to encode the stream number.	O 3.3V		AC'97 codecs are not supported. AC/HDA_SYNC is a boot strap signal (see note below)
AC/HDA_BITCLK	A32	<b>Intel® High Definition Audio Bit Clock Output:</b> This signal is a 24.000MHz serial data clock generated by the Intel® High Definition Audio controller.	O 3.3V		AC'97 codecs are not supported.
AC/HDA_SDOUT	A33	<b>Intel® High Definition Audio Serial Data Out:</b> This signal is the serial TDM data output to the codec(s). This serial output is double-pumped for a bit rate of 48 Mb/s for Intel® High Definition Audio.	O 3.3V		AC'97 codecs are not supported. AC/HDA_SDOUT is a boot strap signal (see note below)
AC/HDA_SDIN[1:0]	B29-B30	<b>Intel® High Definition Audio Serial Data In [1:0]:</b> These signals are serial TDM data inputs from the two codecs. The serial input is single-pumped for a bit rate of 24 Mb/s for Intel® High Definition Audio.	I 3.3V		AC'97 codecs are not supported. AC/HDA_SDIN2 is not supported



### Note

*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module.*

*For more information refer to section 7.5 of this user's guide.*



**Table 4 Gigabit Ethernet Signal Descriptions**

Gigabit Ethernet	Pin #	Description	I/O	PU/PD	Comment															
GBE0_MDI0+	A13	Gigabit Ethernet Controller 0: Media Dependent Interface Differential Pairs 0, 1, 2, 3. The MDI can operate in 1000, 100, and 10Mbit/sec modes. Some pairs are unused in some modes according to the following: <table><tr><td>1000</td><td>100</td><td>10</td></tr><tr><td>MDI[0]+/-</td><td>B1_DA+/-</td><td>TX+/-</td></tr><tr><td>MDI[1]+/-</td><td>B1_DB+/-</td><td>RX+/-</td></tr><tr><td>MDI[2]+/-</td><td>B1_DC+/-</td><td></td></tr><tr><td>MDI[3]+/-</td><td>B1_DD+/-</td><td></td></tr></table>	1000	100	10	MDI[0]+/-	B1_DA+/-	TX+/-	MDI[1]+/-	B1_DB+/-	RX+/-	MDI[2]+/-	B1_DC+/-		MDI[3]+/-	B1_DD+/-		I/O Analog		Twisted pair signals for external transformer.
1000	100		10																	
MDI[0]+/-	B1_DA+/-		TX+/-																	
MDI[1]+/-	B1_DB+/-		RX+/-																	
MDI[2]+/-	B1_DC+/-																			
MDI[3]+/-	B1_DD+/-																			
GBE0_MDI0-	A12																			
GBE0_MDI1+	A10																			
GBE0_MDI1-	A9																			
GBE0_MDI2+	A7																			
GBE0_MDI2-	A6																			
GBE0_MDI3+	A3																			
GBE0_MDI3-	A2																			
GBE0_ACT#	B2	Gigabit Ethernet Controller 0 activity indicator, active low.	O 3.3VSB																	
GBE0_LINK#	A8	Gigabit Ethernet Controller 0 link indicator, active low.	O 3.3VSB																	
GBE0_LINK100#	A4	Gigabit Ethernet Controller 0 100Mbit/sec link indicator, active low.	O 3.3VSB																	
GBE0_LINK1000#	A5	Gigabit Ethernet Controller 0 1000Mbit/sec link indicator, active low.	O 3.3VSB																	
GBE0_CTREF	A14	Reference voltage for Carrier Board Ethernet channel 0 magnetics center tap. The reference voltage is determined by the requirements of the module PHY and may be as low as 0V and as high as 3.3V. The reference voltage output shall be current limited on the module. In the case in which the reference is shorted to ground, the current shall be limited to 250mA or less.			Not connected															



*The GBE0\_LINK# output is only active during a 100Mbit or 1Gbit connection, it is not active during a 10Mbit connection. This is a limitation of Ethernet controller since it only has 3 LED outputs, ACT#, LINK100# and LINK1000#. The GBE0\_LINK# signal is a logic AND of the GBE0\_LINK100# and GBE0\_LINK1000# signals on the conga-TCA module.*

**Table 5 Serial ATA Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
SATA0_RX+ SATA0_RX-	A19 A20	Serial ATA channel 0, Receive Input differential pair.	I SATA		Supports Serial ATA II specification, up to 3 Gb/s
SATA0_TX+ SATA0_TX-	A16 A17	Serial ATA channel 0, Transmit Output differential pair.	O SATA		Supports Serial ATA II specification, up to 3 Gb/s
SATA1_RX+ SATA1_RX-	B19 B20	Serial ATA channel 1, Receive Input differential pair.	I SATA		Supports Serial ATA II specification, up to 3 Gb/s
SATA1_TX+ SATA1_TX-	B16 B17	Serial ATA channel 1, Transmit Output differential pair.	O SATA		Supports Serial ATA II specification, up to 3 Gb/s
SATA2_RX+ SATA2_RX-	A25 A26	Serial ATA channel 2, Receive Input differential pair.	I SATA		Not supported
SATA2_TX+ SATA2_TX-	A22 A23	Serial ATA channel 2, Transmit Output differential pair.	O SATA		Not supported
SATA3_RX+ SATA3_RX-	B25 B26	Serial ATA channel 3, Receive Input differential pair.	I SATA		Not supported
SATA3_TX+ SATA3_TX-	B22 B23	Serial ATA channel 3, Transmit Output differential pair.	O SATA		Not supported
(S)ATA_ACT#	A28	ATA (parallel and serial) or SAS activity indicator, active low.	I/O 3.3v		

**Table 6 PCI Express Signal Descriptions (general purpose)**

Signal	Pin #	Description	I/O	PU/PD	Comment
PCIE_RX0+ PCIE_RX0-	B68 B69	PCI Express channel 0, Receive Input differential pair.	I PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_TX0+ PCIE_TX0-	A68 A69	PCI Express channel 0, Transmit Output differential pair.	O PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_RX1+ PCIE_RX1-	B64 B65	PCI Express channel 1, Receive Input differential pair.	I PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_TX1+ PCIE_TX1-	A64 A65	PCI Express channel 1, Transmit Output differential pair.	O PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_RX2+ PCIE_RX2-	B61 B62	PCI Express channel 2, Receive Input differential pair.	I PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_TX2+ PCIE_TX2-	A61 A62	PCI Express channel 2, Transmit Output differential pair.	O PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_RX3+ PCIE_RX3-	B58 B59	PCI Express channel 3, Receive Input differential pair.	I PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_TX3+ PCIE_TX3-	A58 A59	PCI Express channel 3, Transmit Output differential pair.	O PCIE		Supports PCI Express Base Specification, Revision 1.0a
PCIE_RX4+ PCIE_RX4-	B55 B56	PCI Express channel 4, Receive Input differential pair.	I PCIE		Supports PCI Express Base Specification, Revision 1.0a Only available on modules without USB 3.0 support
PCIE_TX4+ PCIE_TX4-	A55 A56	PCI Express channel 4, Transmit Output differential pair.	O PCIE		Supports PCI Express Base Specification, Revision 1.0a. Only available on modules without USB 3.0 support
PCIE_RX5+ PCIE_RX5-	B52 B53	PCI Express channel 5, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX5+ PCIE_TX5-	A52 A53	PCI Express channel 5, Transmit Output differential pair.	O PCIE		Not supported
PCIE_CLK_REF+ PCIE_CLK_REF-	A88 A89	PCI Express Reference Clock output for all PCI Express and PCI Express Graphics Lanes.	O PCIE		A PCI Express compliant clock buffer chip must be used on the carrier board if more than one PCI Express device is designed in.

**Table 7 ExpressCard Support Pins Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
EXCD0_CPPE#	A49	ExpressCard 0 capable card request.	I 3.3V	PU 10k 3.3V	
EXCD0_PERST#	A48	ExpressCard 0 Reset	O 3.3V	PD 2.2k	EXCDO_PERST# is a bootstrap signal
EXCD1_CPPE#	B48	ExpressCard 1 capable card request	I 3.3V	PU 10k 3.3V	
EXCD1_PERST#	B47	ExpressCard 1 Reset	O 3.3V		

**Table 8 LPC Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
LPC_AD[0:3]	B4-B7	LPC multiplexed address, command and data bus	I/O 3.3V		
LPC_FRAME#	B3	LPC frame indicates the start of an LPC cycle	O 3.3V		
LPC_DRQ[0:1]#	B8-B9	LPC serial DMA request	I 3.3V		
LPC_SERIRQ	A50	LPC serial interrupt	I/O OD 3.3V	PU 4.99k 3.3V	
LPC_CLK	B10	LPC clock output - 33MHz nominal	O 3.3V	PD 10k	LPC_CLK is a bootstrap signal


**Note**

*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module.*

*For more information refer to section 7.5 of this user's guide.*

**Table 9 USB Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
USB0+	A46	USB Port 0, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB0-	A45	USB Port 0, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB1+	B46	USB Port 1, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB1-	B45	USB Port 1, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB2+	A43	USB Port 2, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB2-	A42	USB Port 2, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB3+	B43	USB Port 3, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB3-	B42	USB Port 3, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB4+	A40	USB Port 4, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB4-	A39	USB Port 4, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB5+	B40	USB Port 5, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB5-	B39	USB Port 5, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB6+	A37	USB Port 6, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB6-	A36	USB Port 6, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB7+	B37	USB Port 7, data + or D+	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB7-	B36	USB Port 7, data - or D-	I/O		USB 2.0 compliant. Backwards compatible to USB 1.1
USB_0_1_OC#	B44	USB over-current sense, USB ports 0 and 1. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull this line high on the carrier board.
USB_2_3_OC#	A44	USB over-current sense, USB ports 2 and 3. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low. .	I 3.3VSB	PU 10k 3.3VSB	Do not pull this line high on the carrier board.
USB_4_5_OC#	B38	USB over-current sense, USB ports 4 and 5. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull this line high on the carrier board.
USB_6_7_OC#	A38	USB over-current sense, USB ports 6 and 7. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull this line high on the carrier board.

**Table 10 CRT Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
VGA_RED	B89	Red for monitor. Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	Analog output
VGA_GRN	B91	Green for monitor. Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	Analog output
VGA_BLU	B92	Blue for monitor. Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	Analog output
VGA_HSYNC	B93	Horizontal sync output to VGA monitor	O 3.3V		
VGA_VSYNC	B94	Vertical sync output to VGA monitor	O 3.3V		
VGA_I2C_CK	B95	DDC clock line (I <sup>2</sup> C port dedicated to identify VGA monitor capabilities)	I/O OD 5V	PU 2k2 3.3V	
VGA_I2C_DAT	B96	DDC data line.	I/O OD 5V	PU 2k2 3.3V	

**Table 11 LVDS Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
LVDS_A0+	A71	LVDS Channel A differential pairs	O LVDS		
LVDS_A0-	A72				
LVDS_A1+	A73				
LVDS_A1-	A74				
LVDS_A2+	A75				
LVDS_A2-	A76				
LVDS_A3+	A78				
LVDS_A3-	A79				
LVDS_A_CK+	A81	LVDS Channel A differential clock	O LVDS		
LVDS_A_CK-	A82				
LVDS_B0+	B71	LVDS Channel B differential pairs	O LVDS		Not supported
LVDS_B0-	B72				
LVDS_B1+	B73				
LVDS_B1-	B74				
LVDS_B2+	B75				
LVDS_B2-	B76				
LVDS_B3+	B77				
LVDS_B3-	B78				
LVDS_B_CK+	B81	LVDS Channel B differential clock	O LVDS		Not supported
LVDS_B_CK-	B82				
LVDS_VDD_EN	A77	LVDS panel power enable	O 3.3V	PD 10k	
LVDS_BKLT_EN	B79	LVDS panel backlight enable	O 3.3V	PD 10k	
LVDS_BKLT_CTRL	B83	LVDS panel backlight brightness control	O 3.3V		
LVDS_I2C_CK	A83	DDC lines used for flat panel detection and control.	O 3.3V	PU 2k2 3.3V	
LVDS_I2C_DAT	A84	DDC lines used for flat panel detection and control.	I/O 3.3V	PU 2k2 3.3V	LVDS_I2C_DAT is a boot strap signal (see note below).



*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module.*

*For more information refer to section 7.5 of this user's guide.*

**Table 12 SPI BIOS Flash Interface Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
SPI_CS#	B97	Chip select for Carrier Board SPI BIOS Flash.	O 3.3VSB	PU 10k 3.3VSB	Carrier may pull to SPI_POWER when external SPI provided but not used.
SPI_MISO	A92	Data in to module from carrier board SPI BIOS flash.	I 3.3VSB	PU 10k 3.3VSB	
SPI_MOSI	A95	Data out from module to carrier board SPI BIOS flash.	O 3.3VSB	PU 10k 3.3VSB	
SPI_CLK	A94	Clock from module to carrier board SPI BIOS flash.	O 3.3VSB		
SPI_POWER	A91	Power source for carrier board SPI BIOS flash. SPI_POWER shall be used to power SPI BIOS flash on the carrier only.	+ 3.3VSB		
BIOS_DIS0#	A34	Selection strap to determine the BIOS boot device.	I 3.3VSB	PU 10k 3.3VSB	Carrier shall pull to GND or leave no-connect.
BIOS_DIS1#	B88	Selection strap to determine the BIOS boot device.	I 3.3VSB	PU 10k 3.3VSB	Carrier shall pull to GND or leave no-connect

**Table 13 Miscellaneous Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
I2C_CK	B33	General purpose I <sup>2</sup> C port clock output/input	I/O 3.3V	PU 2K2 3.3VSB	
I2C_DAT	B34	General purpose I <sup>2</sup> C port data I/O line	I/O 3.3V	PU 2K2 3.3VSB	
SPKR	B32	Output for audio enunciator, the “speaker” in PC-AT systems	O 3.3V	PU 1k 3.3V	SPEAKER is a boot strap signal (see note below)
WDT	B27	Output indicating that a watchdog time-out event has occurred.	O 3.3V	PD 10k	
FAN_PWMOUT	B101	Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan’s RPM.	O OD 3.3V	PU 10k 3.3V	
FAN_TACHIN	B102	Fan tachometer input.	I OD	PU 10k 3.3V	Requires a fan with a two pulse output.
TPM_PP	A96	Physical Presence pin of Trusted Platform Module (TPM). Active high. TPM chip has an internal pull-down. This signal is used to indicate Physical Presence to the TPM.	I 3.3V		Trusted Platform Module chip is optional.


**Note**

*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module. For more information refer to section 7.5 of this user’s guide.*

**Table 14 General Purpose I/O Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
GPO0	A93	General purpose output pins. Shared with SD_CLK. Output from COM Express, input to SD	O 3.3V		SDIO interface is not supported on the conga-TCA
GPO1	B54	General purpose output pins. Shared with SD_CMD. Output from COM Express, input to SD	O 3.3V		SDIO interface is not supported on the conga-TCA
GPO2	B57	General purpose output pins. Shared with SD_WP. Output from COM Express, input to SD	O 3.3V		SDIO interface is not supported on the conga-TCA
GPO3	B63	General purpose output pins. Shared with SD_CD. Output from COM Express, input to SD	O 3.3V		SDIO interface is not supported on the conga-TCA
GPI0	A54	General purpose input pins. Pulled high internally on the module. Shared with SD_DATA0. Bidirectional signal	I 3.3V	PU 10K 3.3V	SDIO interface is not supported on the conga-TCA
GPI1	A63	General purpose input pins. Pulled high internally on the module. Shared with SD_DATA1. Bidirectional signal	I 3.3V	PU 10K 3.3V	SDIO interface is not supported on the conga-TCA
GPI2	A67	General purpose input pins. Pulled high internally on the module. Shared with SD_DATA2. Bidirectional signal	I 3.3V	PU 10K 3.3V	SDIO interface is not supported on the conga-TCA
GPI3	A85	General purpose input pins. Pulled high internally on the module. Shared with SD_DATA3. Bidirectional signal.	I 3.3V	PU 10K 3.3V	SDIO interface is not supported on the conga-TCA

**Table 15 Power and System Management Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
PWRBTN#	B12	Power button to bring system out of S5 (soft off), active on rising edge.	I 3.3VSB	PU 10k 3.3VSB	
SYS_RESET#	B49	Reset button input. Active low input. Edge triggered. System will not be held in hardware reset while this input is kept low.	I 3.3VSB	PU 10k 3.3VSB	
CB_RESET#	B50	Reset output from module to Carrier Board. Active low. Issued by module chipset and may result from a low SYS_RESET# input, a low PWR_OK input, a VCC_12V power input that falls below the minimum specification, a watchdog timeout, or may be initiated by the module software.	O 3.3V	PD 100k	
PWR_OK	B24	Power OK from main power supply. A high value indicates that the power is good.	I 3.3V		Set by resistor divider to accept 3.3V.
SUS_STAT#	B18	Indicates imminent suspend operation; used to notify LPC devices.	O 3.3VSB		
SUS_S3#	A15	Indicates system is in Suspend to RAM state. Active-low output. An inverted copy of SUS_S3# on the carrier board (also known as "PS_ON#") may be used to enable the non-standby power on a typical ATX power supply.	O 3.3VSB		
SUS_S4#	A18	Indicates system is in Suspend to Disk state. Active low output.	O 3.3VSB		Not supported
SUS_S5#	A24	Indicates system is in Soft Off state.	O 3.3VSB		
WAKE0#	B66	PCI Express wake up signal.	I 3.3VSB	PU 2.2k 3.3VSB	
WAKE1#	B67	General purpose wake up signal. May be used to implement wake-up on PS/2 keyboard or mouse activity.	I 3.3VSB	PU 2.2k 3.3VSB	
BATLOW#	A27	Battery low input. This signal may be driven low by external circuitry to signal that the system battery is low, or may be used to signal some other external power-management event.	I 3.3VSB	PU 10k 3.3VSB	



Signal	Pin #	Description	I/O	PU/PD	Comment
THRM#	B35	Input from off-module temp sensor indicating an over-temp situation.	I 3.3V	PU 10k 3.3V	
THERMTRIP#	A35	Active low output indicating that the CPU has entered thermal shutdown.	O 3.3V	PU 10k 3.3V	
SMB_CK	B13	System Management Bus bidirectional clock line.	I/O 3.3VSB	PU 10k 3.3VSB	
SMB_DAT#	B14	System Management Bus bidirectional data line.	I/O OD 3.3VSB	PU 10k 3.3VSB	
SMB_ALERT#	B15	System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system.	I 3.3VSB	PU 10k 3.3VSB	
LID#	A103	Lid button. Used by the ACPI operating system for a LID switch.	I OD 3.3V	PU 10k 3.3VSB	
SLEEP#	B103	Sleep button. Used by the ACPI operating system to bring the system to sleep state or to wake it up again.	I OD 3.3V	PU 10k 3.3VSB	

**Table 16 General Purpose Serial Interface Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
SER0_TX	A98	General purpose serial port transmitter	O 3.3V		Not supported
SER1_TX	A101	General purpose serial port transmitter	O 3.3V		Not supported
SER0_RX	A99	General purpose serial port receiver	I 3.3V		Not supported
SER1_RX	A102	General purpose serial port receiver	I 3.3V		Not supported

**Table 17 Power and GND Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
VCC_12V	A104-A109 B104-B109	Primary power input: +12V nominal. All available VCC_12V pins on the connector(s) shall be used.	P		
VCC_5V_SBY	B84-B87	Standby power input: +5.0V nominal. If VCC5_SBY is used, all available VCC_5V_SBY pins on the connector(s) shall be used. Only used for standby and suspend functions. May be left unconnected if these functions are not used in the system design.	P		
VCC_RTC	A47	Real-time clock circuit-power input. Nominally +3.0V.	P		
GND	A1, A11, A21, A31, A41, A51, A57, A60, A66, A70, A80, A90, A100, A110, B1, B11, B21, B31, B41, B51, B60, B70, B80, B90, B100, B110	Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to Carrier Board GND plane.	P		

## 7.2 A-B Connector Pinout

**Table 18 Connector A-B Pinout**

Pin	Row A	Pin	Row B	Pin	Row A	Pin	Row B
A1	GND (FIXED)	B1	GND (FIXED)	A56	PCIE_TX4-	B56	PCIE_RX4-
A2	GBE0_MDI3-	B2	GBE0_ACT#	A57	GND	B57	GPO2
A3	GBE0_MDI3+	B3	LPC_FRAME#	A58	PCIE_TX3+	B58	PCIE_RX3+
A4	GBE0_LINK100#	B4	LPC_AD0	A59	PCIE_TX3-	B59	PCIE_RX3-
A5	GBE0_LINK1000#	B5	LPC_AD1	A60	GND (FIXED)	B60	GND (FIXED)
A6	GBE0_MDI2-	B6	LPC_AD2	A61	PCIE_TX2+	B61	PCIE_RX2+
A7	GBE0_MDI2+	B7	LPC_AD3	A62	PCIE_TX2-	B62	PCIE_RX2-
A8	GBE0_LINK#	B8	LPC_DRQ0#	A63	GPI1	B63	GPO3
A9	GBE0_MDI1-	B9	LPC_DRQ1#	A64	PCIE_TX1+	B64	PCIE_RX1+
A10	GBE0_MDI1+	B10	LPC_CLK	A65	PCIE_TX1-	B65	PCIE_RX1-
A11	GND (FIXED)	B11	GND (FIXED)	A66	GND	B66	WAKE0#
A12	GBE0_MDI0-	B12	PWRBTN#	A67	GPI2	B67	WAKE1#
A13	GBE0_MDI0+	B13	SMB_CK	A68	PCIE_TX0+	B68	PCIE_RX0+
A14	GBE0_CTREF (*)	B14	SMB_DAT	A69	PCIE_TX0-	B69	PCIE_RX0-
A15	SUS_S3#	B15	SMB_ALERT#	A70	GND (FIXED)	B70	GND (FIXED)
A16	SATA0_TX+	B16	SATA1_TX+	A71	LVDS_A0+	B71	LVDS_B0+ (*)
A17	SATA0_TX-	B17	SATA1_TX-	A72	LVDS_A0-	B72	LVDS_B0- (*)
A18	SUS_S4#	B18	SUS_STAT#	A73	LVDS_A1+	B73	LVDS_B1+ (*)
A19	SATA0_RX+	B19	SATA1_RX+	A74	LVDS_A1-	B74	LVDS_B1- (*)
A20	SATA0_RX-	B20	SATA1_RX-	A75	LVDS_A2+	B75	LVDS_B2+ (*)
A21	GND (FIXED)	B21	GND (FIXED)	A76	LVDS_A2-	B76	LVDS_B2- (*)
A22	SATA2_TX+ (*)	B22	SATA3_TX+ (*)	A77	LVDS_VDD_EN	B77	LVDS_B3+ (*)
A23	SATA2_TX- (*)	B23	SATA3_TX- (*)	A78	LVDS_A3+	B78	LVDS_B3- (*)
A24	SUS_S5#	B24	PWR_OK	A79	LVDS_A3-	B79	LVDS_BKLT_EN
A25	SATA2_RX+ (*)	B25	SATA3_RX+ (*)	A80	GND (FIXED)	B80	GND (FIXED)
A26	SATA2_RX- (*)	B26	SATA3_RX- (*)	A81	LVDS_A_CK+	B81	LVDS_B_CK+ (*)
A27	BATLOW#	B27	WDT	A82	LVDS_A_CK-	B82	LVDS_B_CK- (*)
A28	(S)ATA_ACT#	B28	AC/HDA_SDIN2 (*)	A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1	A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0	A85	GPI3	B85	VCC_5V_SBY
A31	GND (FIXED)	B31	GND (FIXED)	A86	RSVD	B86	VCC_5V_SBY
A32	AC/HDA_BITCLK	B32	SPKR	A87	RSVD	B87	VCC_5V_SBY
A33	AC/HDA_SDOUT	B33	I2C_CK	A88	PCIE0_CK_REF+	B88	BIOS_DIS1#
A34	BIOS_DIS0#	B34	I2C_DAT	A89	PCIE0_CK_REF-	B89	VGA_RED
A35	THRMTRIP#	B35	THRM#	A90	GND (FIXED)	B90	GND (FIXED)
A36	USB6-	B36	USB7-	A91	SPI_POWER	B91	VGA_GRN
A37	USB6+	B37	USB7+	A92	SPI_MISO	B92	VGA_BLU

Pin	Row A	Pin	Row B	Pin	Row A	Pin	Row B
A38	USB_6_7_OC#	B38	USB_4_5_OC#	A93	GPO0	B93	VGA_HSYNC
A39	USB4-	B39	USB5-	A94	SPI_CLK	B94	VGA_VSYNC
A40	USB4+	B40	USB5+	A95	SPI_MOSI	B95	VGA_I2C_CK
A41	GND (FIXED)	B41	GND (FIXED)	A96	TPM_PP	B96	VGA_I2C_DAT
A42	USB2-	B42	USB3-	A97	TYPE10#	B97	SPI_CS#
A43	USB2+	B43	USB3+	A98	SER0_TX (*)	B98	RSVD
A44	USB_2_3_OC#	B44	USB_0_1_OC#	A99	SER0_RX (*)	B99	RSVD
A45	USB0-	B45	USB1-	A100	GND (FIXED)	B100	GND (FIXED)
A46	USB0+	B46	USB1+	A101	SER1_TX (*)	B101	FAN_PWMOUT
A47	VCC_RTC	B47	EXCD1_PERST#	A102	SER1_RX (*)	B102	FAN_TACHIN
A48	EXCD0_PERST#	B48	EXCD1_CPPE#	A103	LID#	B103	SLEEP#
A49	EXCD0_CPPE#	B49	SYS_RESET#	A104	VCC_12V	B104	VCC_12V
A50	LPC_SERIRQ	B50	CB_RESET#	A105	VCC_12V	B105	VCC_12V
A51	GND (FIXED)	B51	GND (FIXED)	A106	VCC_12V	B106	VCC_12V
A52	PCIE_TX5+ (*)	B52	PCIE_RX5+ (*)	A107	VCC_12V	B107	VCC_12V
A53	PCIE_TX5- (*)	B53	PCIE_RX5- (*)	A108	VCC_12V	B108	VCC_12V
A54	GPI0	B54	GPO1	A109	VCC_12V	B109	VCC_12V
A55	PCIE_TX4+	B55	PCIE_RX4+	A110	GND (FIXED)	B110	GND (FIXED)



*The signals marked with an asterisk symbol (\*) are not supported on the conga TCA.*

## 7.3 C-D Connector Signal Descriptions

**Table 19 PCI Express Signal Descriptions (general purpose)**

Signal	Pin #	Description	I/O	PU/PD	Comment
PCIE_RX6+ PCIE_RX6-	C19 C20	PCI Express channel 6, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX6+ PCIE_TX6-	D19 D20	PCI Express channel 6, Transmit Output differential pair.	O PCIE		Not supported
PCIE_RX7+ PCIE_RX7-	C22 C23	PCI Express channel 7, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX7+ PCIE_TX7-	D22 D23	PCI Express channel 7, Transmit Output differential pair.	O PCIE		Not supported

**Table 20 USB Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
USB_SSRX0+	C4	Additional receive signal differential pairs for the Superspeed USB data path	I		Only available on modules with USB 3.0 support
USB_SSRX0-	C3		I		Only available on modules with USB 3.0 support
USB_SSTX0+	D4	Additional transmit signal differential pairs for the Superspeed USB data path	O		Only available on modules with USB 3.0 support
USB_SSTX0-	D3		O		Only available on modules with USB 3.0 support
USB_SSRX1+	C7	Additional receive signal differential pairs for the Superspeed USB data path	I		Only available on modules with USB 3.0 support
USB_SSRX1-	C6		I		Only available on modules with USB 3.0 support
USB_SSTX1+	D7	Additional transmit signal differential pairs for the Superspeed USB data path	O		Only available on modules with USB 3.0 support
USB_SSTX1-	D6		O		Only available on modules with USB 3.0 support
USB_SSRX2+	C10	Additional receive signal differential pairs for the Superspeed USB data path	I		Not supported
USB_SSRX2-	C9		I		Not supported
USB_SSTX2+	D10	Additional transmit signal differential pairs for the Superspeed USB data path	O		Not supported
USB_SSTX2-	D9		O		Not supported
USB_SSRX3+	C13	Additional receive signal differential pairs for the Superspeed USB data path	I		Not supported
USB_SSRX3-	C12		I		Not supported
USB_SSTX3+	D13	Additional transmit signal differential pairs for the Superspeed USB data path	O		Not supported
USB_SSTX3-	D12		O		Not supported



### Note

*USB 3.0 is only supported on PN: 047004 conga-TCA/D2550 xHCI modules.*

**Table 21 PCI Express Signal Descriptions (x16 Graphics)**

Signal	Pin #	Description	I/O	PU/PD	Comment
PEG_RX0+	C52	PCI Express Graphics Receive Input differential pairs. <i>Note: Can also be used as PCI Express Receive Input differential pairs 16 through 31 known as PCIE_RX[16-31] + and -.</i>	I PCIE		Not supported
PEG_RX0-	C53				
PEG_RX1+	C55				
PEG_RX1-	C56				
PEG_RX2+	C58				
PEG_RX2-	C59				
PEG_RX3+	C61				
PEG_RX3-	C62				
PEG_RX4+	C65				
PEG_RX4-	C66				
PEG_RX5+	C68				
PEG_RX5-	C69				
PEG_RX6+	C71				
PEG_RX6-	C72				
PEG_RX7+	C74				
PEG_RX7-	C75				
PEG_RX8+	C78				
PEG_RX8-	C79				
PEG_RX9+	C81				
PEG_RX9-	C82				
PEG_RX10+	C85				
PEG_RX10-	C86				
PEG_RX11+	C88				
PEG_RX11-	C89				
PEG_RX12+	C91				
PEG_RX12-	C92				
PEG_RX13+	C94				
PEG_RX13-	C95				
PEG_RX14+	C98				
PEG_RX14-	C99				
PEG_RX15+	C101				
PEG_RX15-	C102				

Signal	Pin #	Description	I/O	PU/PD	Comment
PEG_TX0+	D52	PCI Express Graphics Transmit Output differential pairs. <i>Note: Can also be used as PCI Express Transmit Output differential pairs 16 through 31 known as PCIE_TX[16-31] + and -.</i>	O PCIE		Not supported
PEG_TX0-	D53				
PEG_TX1+	D55				
PEG_TX1-	D56				
PEG_TX2+	D58				
PEG_TX2-	D59				
PEG_TX3+	D61				
PEG_TX3-	D62				
PEG_TX4+	D65				
PEG_TX4-	D66				
PEG_TX5+	D68				
PEG_TX5-	D69				
PEG_TX6+	D71				
PEG_TX6-	D72				
PEG_TX7+	D74				
PEG_TX7-	D75				
PEG_TX8+	D78				
PEG_TX8-	D79				
PEG_TX9+	D81				
PEG_TX9-	D82				
PEG_TX10+	D85				
PEG_TX10-	D86				
PEG_TX11+	D88				
PEG_TX11-	D89				
PEG_TX12+	D91				
PEG_TX12-	D92				
PEG_TX13+	D94				
PEG_TX13-	D95				
PEG_TX14+	D98				
PEG_TX14-	D99				
PEG_TX15+	D101				
PEG_TX15-	D102				
PEG_LANE_RV#	D54	PCI Express Graphics lane reversal input strap. Pull low on the carrier board to reverse lane order.	I		Not supported



*PCI Express Graphics is not supported on conga-TCA modules*

**Table 22 DDI Signal Description**

Signal	Pin #	Description	I/O	PU/PD	Comment
DDI1_PAIR0+	D26	Multiplexed with SDVO1_RED+, DP1_LANE0+ and TMDS1_DATA2+.	O PCIE		Only TMDS/DP option, no SDVO
DDI1_PAIR0-	D27	Multiplexed with SDVO1_RED-, DP1_LANE0- and TMDS1_DATA2-.			
DDI1_PAIR1+	D29	Multiplexed with SDVO1_GRN+, DP1_LANE1+ and TMDS1_DATA1+.	O PCIE		Only TMDS/DP option, no SDVO
DDI1_PAIR1-	D30	Multiplexed with SDVO1_GRN-, DP1_LANE1- and TMDS1_DATA1-.			
DDI1_PAIR2+	D32	Multiplexed with SDVO1_BLU+, DP1_LANE2+ and TMDS1_DATA0+.	O PCIE		Only TMDS/DP option, no SDVO
DDI1_PAIR2-	D33	Multiplexed with SDVO1_BLU-, DP1_LANE2- and TMDS1_DATA0-.			
DDI1_PAIR3+	D36	Multiplexed with SDVO1_CK+, DP1_LANE3+ and TMDS1_CLK+.	O PCIE		Only TMDS/DP option, no SDVO
DDI1_PAIR3-	D37	Multiplexed with SDVO1_CK-, DP1_LANE3- and TMDS1_CLK-.			
DDI1_PAIR4+	C25	Multiplexed with SDVO1_INT+.			Not supported due to missing SDVO support
DDI1_PAIR4-	C26	Multiplexed with SDVO1_INT-.			
DDI1_PAIR5+	C29	Multiplexed with SDVO1_TVCLKIN+.			Not supported due to missing SDVO support
DDI1_PAIR5-	C30	Multiplexed with SDVO1_TVCLKIN-.			
DDI1_PAIR6+	C15	Multiplexed with SDVO1_FLDSTALL+.			Not supported due to missing SDVO support
DDI1_PAIR6-	C16	Multiplexed with SDVO1_FLDSTALL-.			
DDI1_HPD	C24	Multiplexed with DP1_HPD and HDMI1_HPD.	I 3.3V	PD 1M	
DDI1_CTRLCLK_AUX+	D15	Multiplexed with SDVO1_CTRLCLK, DP1_AUX+ and HMDI1_CTRLCLK. DP AUX+ function if DDI1_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLCLK if DDI1_DDC_AUX_SEL is pulled high	I/O PCIE I/O OD 3.3V	PD100k	
DDI1_CTRLDATA_AUX-	D16	Multiplexed with SDVO1_CTRLDATA, DP1_AUX- and HDMI1_CTRLDATA. DP AUX- function if DDI1_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLDATA if DDI1_DDC_AUX_SEL is pulled high	I/O PCIE I/O OD 3.3V	PU 100k 3.3V	DDI1_CTRLDATA_AUX- is a boot strap signal (see note below). DDI enable strap already populated.
DDI1_DDC_AUX_SEL	D34	Selects the function of DDI1_CTRLCLK_AUX+ and DDI1_CTRLDATA_AUX-. This pin shall have a 1M pull-down to logic ground on the module. If this input is floating, the AUX pair is used for the DP AUX+/- signals. If pulled-high, the AUX pair contains the CTRLCLK and CTRLDATA signals.	I 3.3V	PD 1M	
DDI2_PAIR0+	D39	Multiplexed with DP2_LANE0+ and TMDS2_DATA2+.	O PCIE		
DDI2_PAIR0-	D40	Multiplexed with DP2_LANE0- and TMDS2_DATA2-.			
DDI2_PAIR1+	D42	Multiplexed with DP2_LANE1+ and TMDS2_DATA1+.	O PCIE		
DDI2_PAIR1-	D43	Multiplexed with DP2_LANE1- and TMDS2_DATA1-.			
DDI2_PAIR2+	D46	Multiplexed with DP2_LANE2+ and TMDS2_DATA0+.	O PCIE		
DDI2_PAIR2-	D47	Multiplexed with DP2_LANE2- and TMDS2_DATA0-.			
DDI2_PAIR3+	D49	Multiplexed with DP2_LANE3+ and TMDS2_CLK+.	O PCIE		
DDI2_PAIR3-	D50	Multiplexed with DP2_LANE3- and TMDS2_CLK-.			
DDI2_HPD	D44	Multiplexed with DP2_HPD and HDMI2_HPD.	I 3.3V	PD 1M	
DDI2_CTRLCLK_AUX+	C32	Multiplexed with DP2_AUX+ and HDMI2_CTRLCLK. DP AUX+ function if DDI2_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLCLK if DDI2_DDC_AUX_SEL is pulled high	I/O PCIE I/O OD 3.3V	PD 100k	
DDI2_CTRLDATA_AUX-	C33	Multiplexed with DP2_AUX- and HDMI2_CTRLDATA. DP AUX- function if DDI2_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLDATA if DDI2_DDC_AUX_SEL is pulled high.	I/O PCIE I/O OD 3.3V	PU 100k 3.3V	DDI2_CTRLCLK_AUX- is a boot strap signal (see note below). DDI enable strap already populated.

Signal	Pin #	Description	I/O	PU/PD	Comment
DDI2_DDC_AUX_SEL	C34	Selects the function of DDI2_CTRLCLK_AUX+ and DDI2_CTRLDATA_AUX-. This pin shall have a 1M pull-down to logic ground on the module. If this input is floating, the AUX pair is used for the DP AUX+/- signals. If pulled-high, the AUX pair contains the CTRLCLK and CTRLDATA signals	I 3.3V	PD 1M	
DDI3_PAIR0+	C39	Multiplexed with DP3_LANE0+ and TMDS3_DATA2+.	O PCIE		Not supported
DDI3_PAIR0-	C40	Multiplexed with DP3_LANE0- and TMDS3_DATA2-.			
DDI3_PAIR1+	C42	Multiplexed with DP3_LANE1+ and TMDS3_DATA1+.	O PCIE		Not supported
DDI3_PAIR1-	C43	Multiplexed with DP3_LANE1- and TMDS3_DATA1-.			
DDI3_PAIR2+	C46	Multiplexed with DP3_LANE2+ and TMDS3_DATA0+.	O PCIE		Not supported
DDI3_PAIR2-	C47	Multiplexed with DP3_LANE2- and TMDS3_DATA0-.			
DDI3_PAIR3+	C49	Multiplexed with DP3_LANE3+ and TMDS3_CLK+.	O PCIE		Not supported
DDI3_PAIR3-	C50	Multiplexed with DP3_LANE3- and TMDS3_CLK-.			
DDI3_HPD	C44	Multiplexed with DP3_HPD and HDMI3_HPD.	I 3.3V		Not supported
DDI3_CTRLCLK_AUX+	C36	Multiplexed with DP3_AUX+ and HDMI3_CTRLCLK. DP AUX+ function if DDI3_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLCLK if DDI3_DDC_AUX_SEL is pulled high	I/O PCIE I/O OD 3.3V		Not supported
DDI3_CTRLDATA_AUX-	C37	Multiplexed with DP3_AUX- and HDMI3_CTRLDATA. DP AUX- function if DDI3_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLDATA if DDI3_DDC_AUX_SEL is pulled high.	I/O PCIE I/O OD 3.3V		Not supported
DDI3_DDC_AUX_SEL	C38	Selects the function of DDI3_CTRLCLK_AUX+ and DDI3_CTRLDATA_AUX-. This pin shall have a 1M pull-down to logic ground on the module. If this input is floating, the AUX pair is used for the DP AUX+/- signals. If pulled-high, the AUX pair contains the CTRLCLK and CTRLDATA signals	I 3.3V		Not supported



*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module. For more information refer to section 7.5 of this user's guide.*

*The Digital Display Interface (DDI) signals are multiplexed with HDMI, DisplayPort (DP) and SDVO. The signals for these interfaces are routed to the DDI interface of the COM Express connector. The SDVO interface is however not supported on the conga-TCA.*

*Refer to the HDMI and DisplayPort signal description tables in this section for information about the signals routed to the DDI interface of the COM Express connector.*



**Table 23 HDMI Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
TMDS1_CLK + TMDS1_CLK -	D36 D37	HDMI/DVI TMDS Clock output differential pair. Multiplexed with DDI1_PAIR3+ and DDI1_PAIR3-.	O PCIE		
TMDS1_DATA0+ TMDS1_DATA0-	D32 D33	HDMI/DVI TMDS differential pair. Multiplexed with DDI1_PAIR2+ and DDI1_PAIR2-.	O PCIE		
TMDS1_DATA1+ TMDS1_DATA1-	D29 D30	HDMI/DVI TMDS differential pair. Multiplexed with DDI1_PAIR1+ and DDI1_PAIR1-..	O PCIE		
TMDS1_DATA2+ TMDS1_DATA2-	D26 D27	HDMI/DVI TMDS differential pair. Multiplexed with DDI1_PAIR0+ and DDI1_PAIR0-.	O PCIE		
HDMI1_HPD	C24	HDMI/DVI Hot-plug detect. Multiplexed with DDI1_HPD.	I PCIE	PD 1M	
HDMI1_CTRLCLK	D15	HDMI/DVI I <sup>2</sup> C Control Clock Multiplexed with DDI1_CTRLCLK_AUX+	I/O OD 3.3V	PD 100k	
HDMI1_CTRLDATA	D16	HDMI/DVI I <sup>2</sup> C Control Data Multiplexed with DDI1_CTRLDATA_AUX-	I/O OD 3.3V	PU 100k 3.3V	HDMI1_CTRLDATA is a boot strap signal (see note below). HDMI enable strap already populated
TMDS2_CLK + TMDS2_CLK -	D49 D50	HDMI/DVI TMDS Clock output differential pair.. Multiplexed with DDI2_PAIR3+ and DDI2_PAIR3-.	O PCIE		
TMDS2_DATA0+ TMDS2_DATA0-	D46 D47	HDMI/DVI TMDS differential pair. Multiplexed with DDI2_PAIR2+ and DDI2_PAIR2-.	O PCIE		
TMDS2_DATA1+ TMDS2_DATA1-	D42 D43	HDMI/DVI TMDS differential pair. Multiplexed with DDI2_PAIR1+ and DDI2_PAIR1-.	O PCIE		
TMDS2_DATA2+ TMDS2_DATA2-	D39 D40	HDMI/DVI TMDS differential pair. Multiplexed with DDI2_PAIR0+ and DDI2_PAIR0-..	O PCIE		
HDMI2_HPD	D44	HDMI/DVI Hot-plug detect. Multiplexed with DDI2_HPD	I PCIE	PD 1M	
HDMI2_CTRLCLK	C32	HDMI/DVI I <sup>2</sup> C Control Clock Multiplexed with DDI2_CTRLCLK_AUX+	I/O OD 3.3V	PD 100k	
HDM12_CTRLDATA	C33	HDMI/DVI I <sup>2</sup> C Control Data Multiplexed with DDI2_CTRLDATA_AUX-	I/O OD 3.3V	PU 100k 3.3V	HDMI2_CTRLDATA is a boot strap signal (see note below). HDMI enable strap is already populated.
TMDS3_CLK + TMDS3_CLK -	C49 C50	HDMI/DVI TMDS Clock output differential pair.. Multiplexed with DDI3_PAIR3+ and DDI3_PAIR3-.	O PCIE		Not supported
TMDS3_DATA0+ TMDS3_DATA0-	C46 C47	HDMI/DVI TMDS differential pair. Multiplexed with DDI3_PAIR2+ and DDI3_PAIR2-.	O PCIE		Not supported
TMDS3_DATA1+ TMDS3_DATA1-	C42 C43	HDMI/DVI TMDS differential pair. Multiplexed with DDI3_PAIR1+ and DDI3_PAIR1-..	O PCIE		Not supported
TMDS3_DATA2+ TMDS3_DATA2-	C39 C40	HDMI/DVI TMDS differential pair. Multiplexed with DDI3_PAIR0+ and DDI3_PAIR0-.	O PCIE		Not supported
HDMI3_HPD	C44	HDMI/DVI Hot-plug detect. Multiplexed with DDI3_HPD.	I PCIE		Not supported
HDMI3_CTRLCLK	C36	HDMI/DVI I <sup>2</sup> C Control Clock Multiplexed with DDI3_CTRLCLK_AUX+	I/O OD 3.3V		Not supported

Signal	Pin #	Description	I/O	PU/PD	Comment
HDMI3_CTRLDATA	C37	HDMI/DVI I <sup>2</sup> C Control Data Multiplexed with DDI3_CTRLDATA_AUX-	I/O OD 3.3V		Not supported

**Note**

*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module. For more information refer to section 7.5 of this user's guide.*

**Table 24 DisplayPort (DP) Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
DP1_LANE3+ DP1_LANE3-	D36 D37	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI1_PAIR3+ and DDI1_PAIR3-.	O PCIE		
DP1_LANE2+ DP1_LANE2-	D32 D33	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI1_PAIR2+ and DDI1_PAIR2-.	O PCIE		
DP1_LANE1+ DP1_LANE1-	D29 D30	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI1_PAIR1+ and DDI1_PAIR1-.	O PCIE		
DP1_LANE0+ DP1_LANE0-	D26 D27	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI1_PAIR0+ and DDI1_PAIR0-.	O PCIE		
DP1_HPD	C24	Detection of Hot Plug / Unplug and notification of the link layer. Multiplexed with DDI1_HPD.	I 3.3V	PD 1M	
DP1_AUX+	D15	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE	PD 100k	
DP1_AUX-	D16	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE	PU 100k 3.3V	DP1_AUX- is a boot strap signal (see note below). DP enable strap is already populated.
DP2_LANE3+ DP2_LANE3-	D49 D50	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI2_PAIR3+ and DDI2_PAIR3-.	O PCIE		
DP2_LANE2+ DP2_LANE2-	D46 D47	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI2_PAIR2+ and DDI2_PAIR2-.	O PCIE		
DP2_LANE1+ DP2_LANE1-	D42 D43	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI2_PAIR1+ and DDI2_PAIR1-.	O PCIE		
DP2_LANE0+ DP2_LANE0-	D39 D40	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI2_PAIR0+ and DDI1_PAIR0-.	O PCIE		
DP2_HPD	D44	Detection of Hot Plug / Unplug and notification of the link layer. Multiplexed with DDI2_HPD.	I 3.3V	PD 1M	
DP2_AUX+	C32	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE	PD 100k	
DP2_AUX-	C33	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE	PU 100k 3.3V	DP2_AUX- is a boot strap signal (see note below). DP enable strap already populated.
DP3_LANE3+ DP3_LANE3-	C49 C50	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI3_PAIR3+ and DDI3_PAIR3-.	O PCIE		Not supported
DP3_LANE2+ DP3_LANE2-	C46 C47	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI3_PAIR2+ and DDI3_PAIR2-.	O PCIE		Not supported

Signal	Pin #	Description	I/O	PU/PD	Comment
DP3_LANE1+ DP3_LANE1-	C42 C43	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI3_PAIR1+ and DDI3_PAIR1-.	O PCIE		Not supported
DP3_LANE0+ DP3_LANE0-	C39 C40	Uni-directional main link for the transport of isochronous streams and secondary data. Multiplexed with DDI3_PAIR0+ and DDI3_PAIR0-.	O PCIE		Not supported
DP3_HPD	C44	Detection of Hot Plug / Unplug and notification of the link layer. Multiplexed with DDI3_HPD.	I 3.3V		Not supported
DP3_AUX+	C36	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE		Not supported
DP3_AUX-	C37	Half-duplex bi-directional AUX channel for services such as link configuration or maintenance and EDID access.	I/O PCIE		Not supported



### Note

*Some signals have special functionality during the reset process. They may bootstrap some basic important functions of the module. For more information refer to section 7.5 of this user's guide.*

**Table 25 Module Type Definition Signal Description**

Signal	Pin #	Description	I/O	Comment																												
TYPE0# TYPE1# TYPE2#	C54 C57 D57	<p>The TYPE pins indicate to the Carrier Board the Pin-out Type that is implemented on the module. The pins are tied on the module to either ground (GND) or are no-connects (NC). For Pinout Type 1, these pins are don't care (X).</p> <table><tr><td>TYPE2#</td><td>TYPE1#</td><td>TYPE0#</td><td></td></tr><tr><td>X</td><td>X</td><td>X</td><td>Pinout Type 1</td></tr><tr><td>NC</td><td>NC</td><td>NC</td><td>Pinout Type 2</td></tr><tr><td>NC</td><td>NC</td><td>GND</td><td>Pinout Type 3 (no IDE)</td></tr><tr><td>NC</td><td>GND</td><td>NC</td><td>Pinout Type 4 (no PCI)</td></tr><tr><td>NC</td><td>GND</td><td>GND</td><td>Pinout Type 5 (no IDE, no PCI)</td></tr><tr><td>GND</td><td>NC</td><td>NC</td><td>Pinout Type 6 (no IDE, no PCI)</td></tr></table> <p>The Carrier Board should implement combinatorial logic that monitors the module TYPE pins and keeps power off (e.g deactivates the ATX_ON signal for an ATX power supply) if an incompatible module pin-out type is detected. The Carrier Board logic may also implement a fault indicator such as an LED.</p>	TYPE2#	TYPE1#	TYPE0#		X	X	X	Pinout Type 1	NC	NC	NC	Pinout Type 2	NC	NC	GND	Pinout Type 3 (no IDE)	NC	GND	NC	Pinout Type 4 (no PCI)	NC	GND	GND	Pinout Type 5 (no IDE, no PCI)	GND	NC	NC	Pinout Type 6 (no IDE, no PCI)	PDS	TYPE[0:2]# signals are available on all modules following the Type 2-6 Pinout standard. The conga-TCA is based on the COM Express Type 6 pinout therefore the pins 0 and 1 are not connected and pin 2 is connected to GND.
TYPE2#	TYPE1#	TYPE0#																														
X	X	X	Pinout Type 1																													
NC	NC	NC	Pinout Type 2																													
NC	NC	GND	Pinout Type 3 (no IDE)																													
NC	GND	NC	Pinout Type 4 (no PCI)																													
NC	GND	GND	Pinout Type 5 (no IDE, no PCI)																													
GND	NC	NC	Pinout Type 6 (no IDE, no PCI)																													
TYPE10#	A97	<p>Dual use pin. Indicates to the carrier board that a Type 10 module is installed. Indicates to the carrier that a Rev. 1.0/2.0 module is installed.</p> <p>TYPE10#</p> <table><tr><td>NC</td><td>Pinout R2.0</td></tr><tr><td>PD</td><td>Pinout Type 10 pull down to ground with 4.7k resistor</td></tr><tr><td>12V</td><td>Pinout R1.0</td></tr></table> <p>This pin is reclaimed from VCC_12V pool. In R1.0 modules this pin will connect to other VCC_12V pins. In R2.0 this pin is defined as a no-connect for Types 1-6. A carrier can detect a R1.0 module by the presence of 12V on this pin. R2.0 module Types 1-6 will no-connect this pin. Type 10 modules shall pull this pin to ground through a 4.7k resistor.</p>	NC	Pinout R2.0	PD	Pinout Type 10 pull down to ground with 4.7k resistor	12V	Pinout R1.0	PDS	Not connected to indicate “Pinout R2.0”.																						
NC	Pinout R2.0																															
PD	Pinout Type 10 pull down to ground with 4.7k resistor																															
12V	Pinout R1.0																															

**Table 26 Power and GND Signal Descriptions**

Signal	Pin #	Description	I/O	PU/PD	Comment
VCC_12V	C104-C109 D104-D109	Primary power input: +12V nominal. All available VCC_12V pins on the connector(s) shall be used.	P		
GND	C1, C2, C5, C8, C11, C14, C21, C31, C41, C51, C60, C70, C73, C76, C80, C84, C87, C90, C93, C96, C100, C103, C110, D1, D2, D5, D8, D11, D14, D21, D31, D41, D51, D60, D67, D70, D73, D76, D80, D84, D87, D90, D93, D96, D100, D103, D110	Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to carrier board GND plane.	P		

## 7.4 C-D Connector Pinout

**Table 27 Connector C-D Pinout**

Pin	Row C	Pin	Row D	Pin	Row C	Pin	Row D
C1	GND (FIXED)	D1	GND (FIXED)	C56	PEG_RX1- (*)	D56	PEG_TX1- (*)
C2	GND	D2	GND	C57	TYPE1#	D57	TYPE2#
C3	USB_SSRX0-	D3	USB_SSTX0-	C58	PEG_RX2+ (*)	D58	PEG_TX2+ (*)
C4	USB_SSRX0+	D4	USB_SSTX0+	C59	PEG_RX2- (*)	D59	PEG_TX2- (*)
C5	GND	D5	GND	C60	GND (FIXED)	D60	GND (FIXED)
C6	USB_SSRX1-	D6	USB_SSTX1-	C61	PEG_RX3+ (*)	D61	PEG_TX3+ (*)
C7	USB_SSRX1+	D7	USB_SSTX1+	C62	PEG_RX3- (*)	D62	PEG_TX3- (*)
C8	GND	D8	GND	C63	RSVD	D63	DDPC_CTRLCLK
C9	USB_SSRX2- (*)	D9	USB_SSTX2- (*)	C64	RSVD	D64	DDPC_CTRLDATA
C10	USB_SSRX2+ (*)	D10	USB_SSTX2+ (*)	C65	PEG_RX4+ (*)	D65	PEG_TX4+ (*)
C11	GND (FIXED)	D11	GND (FIXED)	C66	PEG_RX4- (*)	D66	PEG_TX4- (*)
C12	USB_SSRX3- (*)	D12	USB_SSTX3- (*)	C67	RSVD	D67	GND
C13	USB_SSRX3+ (*)	D13	USB_SSTX3+ (*)	C68	PEG_RX5+ (*)	D68	PEG_TX5+ (*)
C14	GND	D14	GND	C69	PEG_RX5- (*)	D69	PEG_TX5- (*)
C15	DDI1_PAIR6+ (*)	D15	DDI1_CTRLCLK_AUX+	C70	GND (FIXED)	D70	GND (FIXED)
C16	DDI1_PAIR6- (*)	D16	DDI1_CTRLDATA_AUX-	C71	PEG_RX6+ (*)	D71	PEG_TX6+ (*)
C17	RSVD	D17	RSVD	C72	PEG_RX6- (*)	D72	PEG_TX6- (*)
C18	RSVD	D18	RSVD	C73	GND	D73	GND
C19	PCIE_RX6+ (*)	D19	PCIE_TX6+ (*)	C74	PEG_RX7+ (*)	D74	PEG_TX7+ (*)
C20	PCIE_RX6- (*)	D20	PCIE_TX6- (*)	C75	PEG_RX7- (*)	D75	PEG_TX7- (*)
C21	GND (FIXED)	D21	GND (FIXED)	C76	GND	D76	GND
C22	PCIE_RX7+ (*)	D22	PCIE_TX7+ (*)	C77	RSVD	D77	RSVD
C23	PCIE_RX7- (*)	D23	PCIE_TX7- (*)	C78	PEG_RX8+ (*)	D78	PEG_TX8+ (*)
C24	DDI1_HPDP	D24	RSVD	C79	PEG_RX8- (*)	D79	PEG_TX8- (*)
C25	DDI1_PAIR4+ (*)	D25	RSVD	C80	GND (FIXED)	D80	GND (FIXED)
C26	DDI1_PAIR4- (*)	D26	DDI1_PAIR0+	C81	PEG_RX9+ (*)	D81	PEG_TX9+ (*)
C27	RSVD	D27	DDI1_PAIR0-	C82	PEG_RX9- (*)	D82	PEG_TX9- (*)
C28	RSVD	D28	RSVD	C83	RSVD	D83	RSVD
C29	DDI1_PAIR5+ (*)	D29	DDI1_PAIR1+	C84	GND	D84	GND
C30	DDI1_PAIR5- (*)	D30	DDI1_PAIR1-	C85	PEG_RX10+ (*)	D85	PEG_TX10+ (*)
C31	GND (FIXED)	D31	GND (FIXED)	C86	PEG_RX10- (*)	D86	PEG_TX10- (*)
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+	C87	GND	D87	GND
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-	C88	PEG_RX11+ (*)	D88	PEG_TX11+ (*)
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL	C89	PEG_RX11- (*)	D89	PEG_TX11- (*)
C35	RSVD	D35	RSVD	C90	GND (FIXED)	D90	GND (FIXED)
C36	DDI3_CTRLCLK_AUX+ (*)	D36	DDI1_PAIR3+	C91	PEG_RX12+ (*)	D91	PEG_TX12+ (*)
C37	DDI3_CTRLDATA_AUX- (*)	D37	DDI1_PAIR3-	C92	PEG_RX12- (*)	D92	PEG_TX12- (*)

Pin	Row C	Pin	Row D	Pin	Row C	Pin	Row D
C38	DDI3_DDC_AUX_SEL (*)	D38	RSVD	C93	GND	D93	GND
C39	DDI3_PAIR0+ (*)	D39	DDI2_PAIR0+	C94	PEG_RX13+ (*)	D94	PEG_TX13+ (*)
C40	DDI3_PAIR0- (*)	D40	DDI2_PAIR0-	C95	PEG_RX13- (*)	D95	PEG_TX13- (*)
C41	GND (FIXED)	D41	GND (FIXED)	C96	GND	D96	GND
C42	DDI3_PAIR1+ (*)	D42	DDI2_PAIR1+	C97	RVSD	D97	RSVD
C43	DDI3_PAIR1- (*)	D43	DDI2_PAIR1-	C98	PEG_RX14+ (*)	D98	PEG_TX14+ (*)
C44	DDI3_HPD (*)	D44	DDI2_HPD	C99	PEG_RX14- (*)	D99	PEG_TX14- (*)
C45	RSVD	D45	RSVD	C100	GND (FIXED)	D100	GND (FIXED)
C46	DDI3_PAIR2+ (*)	D46	DDI2_PAIR2+	C101	PEG_RX15+ (*)	D101	PEG_TX15+ (*)
C47	DDI3_PAIR2- (*)	D47	DDI2_PAIR2-	C102	PEG_RX15- (*)	D102	PEG_TX15- (*)
C48	RSVD	D48	RSVD	C103	GND	D103	GND
C49	DDI3_PAIR3+ (*)	D49	DDI2_PAIR3+	C104	VCC_12V	D104	VCC_12V
C50	DDI3_PAIR3- (*)	D50	DDI2_PAIR3-	C105	VCC_12V	D105	VCC_12V
C51	GND (FIXED)	D51	GND (FIXED)	C106	VCC_12V	D106	VCC_12V
C52	PEG_RX0+ (*)	D52	PEG_TX0+ (*)	C107	VCC_12V	D107	VCC_12V
C53	PEG_RX0- (*)	D53	PEG_TX0- (*)	C108	VCC_12V	D108	VCC_12V
C54	TYPE0#	D54	PEG_LANE_RV#	C109	VCC_12V	D109	VCC_12V
C55	PEG_RX1+ (*)	D55	PEG_TX1+ (*)	C110	GND (FIXED)	D110	GND (FIXED)



*The signals marked with an asterisk symbol (\*) are not supported on the conga-TCA.*

## 7.5 Boot Strap Signals

**Table 28 Boot Strap Signal Descriptions**

Signal	Pin #	Description of Boot Strap Signal	I/O	PU/PD	Comment
AC/HDA_SYNC	A29	<b>High Definition Audio Sync:</b> This signal is a 48 kHz fixed rate sample sync to the codec(s). It is also used to encode the stream number.	O 3.3VSB		AC/HDA_SYNC is a boot strap signal (see caution statement below)
AC/HDA_SDOUT	A33	<b>High Definition Audio Serial Data Out:</b> This signal is the serial TDM data output to the codec(s). This serial output is double-pumped for a bit rate of 48 Mb/s for High Definition Audio.	O 3.3VSB		AC/HDA_SDOUT is a boot strap signal (see caution statement below)
LVDS_I2C_DAT	A84	DDC lines used for flat panel detection and control.	I/O 3.3V	PU 2k2 3.3V	LVDS_I2C_DAT is a boot strap signal (see caution statement below).
SPKR	B32	Output for audio enunciator, the “speaker” in PC-AT systems	O 3.3V	PD 1k	SPKR is a boot strap signal (see caution statement below)
EXCD0_PERST#	A48	ExpressCard 0 Reset	O 3.3V	PD 2.2k	EXCD0_PERST# is a boot strap signal
DDI1_CTRLDATA_AUX- DP1_AUX- HDMI_CTRLDATA	D16	Multiplexed with DP1_AUX- and HDMI1_CTRLDATA. DP AUX- function if DDI1_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLDATA if DDI1_DDC_AUX_SEL is pulled high.	I/O PCIE I/O OD 3.3V	PU100k 3.3V	DDI1_CTRLDATA_AUX- is a boot strap signal (see caution statement below).
DDI2_CTRLDATA_AUX- DP2_AUX- HDM2_CTRLDATA	C33	Multiplexed with DP2_AUX- and HDMI2_CTRLDATA. DP AUX- function if DDI2_DDC_AUX_SEL is no connect. HDMI/DVI I2C CTRLDATA if DDI2_DDC_AUX_SEL is pulled high.	I/O PCIE I/O OD 3.3V	PU100k 3.3V	DDI2_CTRLDATA_AUX- is a boot strap signal (see caution statement below).
LPC_CLK	B10	LPC clock output - 33MHz nominal	O 3.3V	PD 10k	LPC_CLK is a bootstrap signal (see caution statement below)



### Caution

*The signals listed in the table above are used as chipset configuration straps during system reset. In this condition (during reset), they are inputs that are pulled to the correct state by either COM Express™ internally implemented resistors or chipset internally implemented resistors that are located on the module. No external DC loads or external pull-up or pull-down resistors should change the configuration of the signals listed in the above table. External resistors may override the internal strap states and cause the COM Express™ module to malfunction and/or cause irreparable damage to the module.*



## 8 System Resources

### 8.1 System Memory Map

**Table 29** Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
(TOM-xxxx) – TOM	N.A.	N.A.	ACPI reclaim, PCI memory range, Video, ....
1024kB – (TOM-xxxx)	100000 – N.A.	N.A.	Extended memory
869kB – 1024kB	E0000 - FFFFF	128kB	Runtime BIOS
768kB – 896kB	C0000 - DFFFF		Expansion Area
640kB – 768kB	A0000 - BFFFF	128kB	Video memory and BIOS
639kB – 640kB	9FC00 - 9FFFF	1kB	Extended BIOS data
0 – 639kB	00000 - 9FC00	512kB	Conventional memory



#### Note

*T.O.M. = Top of memory = max. DRAM installed*

### 8.2 I/O Address Assignment

The I/O address assignment of the conga-TCA module is functionally identical with a standard PC/AT. The BIOS assigns PCI and PCI Express I/O resources from FFF0h downwards. Non PnP/PCI/PCI Express compliant devices must not consume I/O resources in that area.

#### 8.2.1 LPC Bus

On the conga-TCA, the internal PCI Bus acts as the subtractive decoding agent. All I/O cycles that are not positively decoded are forwarded to the internal PCI Bus not the LPC Bus. Only specified I/O ranges are forwarded to the LPC Bus. In the congatec Embedded BIOS the following I/O address ranges are sent to the LPC Bus:

2Eh – 2Fh  
 4Eh – 4Fh  
 60h, 61h-64h  
 2E8h – 2EFh  
 2F8h – 2FFh  
 378h – 37Fh

3E8h – 3EFh  
3F8h – 3FFh  
778h – 77Fh  
A00h – BFFh

Parts of these ranges are not available if a Super I/O is used on the carrier board. If a Super I/O is not implemented on the carrier board, then these ranges are available for customer use. If you require additional LPC Bus resources other than those mentioned above, or more information about this subject, contact congatec technical support for assistance.

## 8.3 Interrupt Request (IRQ) Lines

**Table 30** IRQ Lines in PIC mode

IRQ#	Available	Typical Interrupt Source	Connected to Pin
0	No	Counter 0	Not applicable
1	No	Keyboard	Not applicable
2	No	Cascade Interrupt from Slave PIC	Not applicable
3	Yes		IRQ3 via SERIRQ or PCI BUS INTx
4	Yes		IRQ4 via SERIRQ or PCI BUS INTx
5	Yes		IRQ5 via SERIRQ or PCI BUS INTx
6	Yes		IRQ6 via SERIRQ or PCI BUS INTx
7	No		Reserved for BIOS purposes
8	No	Real-time Clock	Not applicable
9	No	SCI	Not applicable
10	Yes		IRQ10 via SERIRQ or PCI BUS INTx
11	Yes		IRQ11 via SERIRQ or PCI BUS INTx
12	Yes		IRQ12 via SERIRQ or PCI BUS INTx
13	No	Math processor	Not applicable
14	Yes		PCI BUS INTx
15	Yes		PCI BUS INTx



*In PIC mode, the PCI bus interrupt lines can be routed to any free IRQ.*

**Table 31 IRQ Lines in APIC mode**

IRQ#	Available	Typical Interrupt Source	Connected to Pin / Function
0	No	Counter 0	Not applicable
1	No	Keyboard	Not applicable
2	No	Cascade Interrupt from Slave PIC	Not applicable
3	Yes		IRQ3 via SERIRQ
4	Yes		IRQ4 via SERIRQ
5	Yes		IRQ5 via SERIRQ
6	Yes		IRQ6 via SERIRQ
7	No		Reserved for BIOS purposes
8	No	Real-time Clock	Not applicable
9	No	SCI	SCI
10	Yes		IRQ10 via SERIRQ
11	Yes		IRQ11 via SERIRQ
12	Yes		IRQ12 via SERIRQ
13	No	Math processor	Not applicable
14	Yes		
15	Yes		
16	No		PIRQA, Integrated VGA Controller, UHCI Controller #3, PCI Express Root Port 0, PCI Express Port 0, PCI Express Port 1, PCI Express Port 3
17	No		PIRQB, PCI Express Root Port 0, PCI Express Port 0, PCI Express Port 1, PCI Express Port 3
18	No		PIRQC, UHCI Controller #2, PCI Express Root Port 0, PCI Express Port 0, PCI Express Port 1, PCI Express Port 3, Jmicron PATA Controller
19	No		PIRQD, PCI Express Root Port 0, PCI Express Port 0, PCI Express Port 1, PCI Express Port 3, SMBUS Controller, UHCI Controller #1
20	Yes		PIRQE, onboard Gigabit LAN Controller, COMx Slot #0, COMx Slot #1, COMx Slot #2, COMx Slot #3
21	Yes		PIRQF, COMx Slot #0, COMx Slot #1, COMx Slot #2, COMx Slot #3
22	Yes		PIRQG, Intel High Definition Audio Controller, COMx Slot #0, COMx Slot #1, COMx Slot #2, COMx Slot #3
23	Yes		PIRQH, EHCI Host Controller #1, UHCI Controller #0, COMx Slot #0, COMx Slot #1, COMx Slot #2, COMx Slot #3



*In APIC mode, the PCI bus interrupt lines are connected with IRQ 16, 17, 18 and 19.*

## 8.4 PCI Configuration Space Map

**Table 32** PCI Configuration Space Map

Bus Number (hex)	Device Number (hex)	Function Number (hex)	PCI Interrupt Routing	Description
00h	00h	00h	N.A.	Host Bridge
00h	02h	00h	Internal	VGA Graphics
00h	1Bh	00h	Internal	Intel High Definition Audio Controller
00h (Note1)	1Ch	00h	Internal	PCI Express Root Port 1
00h (Note1)	1Ch	01h	Internal	PCI Express Root Port 2
00h (Note1)	1Ch	02h	Internal	PCI Express Root Port 3
00h (Note1)	1Ch	03h	Internal	PCI Express Root Port 4
00h	1Dh	00h	Internal	USB UHCI Controller #1
00h	1Dh	01h	Internal	USB UHCI Controller #2
00h	1Dh	02h	Internal	USB UHCI Controller #3
00h	1Dh	03h	Internal	USB UHCI Controller #4
00h	1Dh	07h	Internal	USB 2.0 EHCI Controller #1
00h	1Eh	00h	N.A.	PCI to PCI Bridge
00h	1Fh	00h	N.A.	LPC Controller
00h	1Fh	02h	Internal	Serial ATA Controller
00h	1Fh	03h	Internal	SMBus Controller
02h	00h	00h	N.A.	Texas Instruments PCI Express Hub
03h	00h	00h	Internal	PCI Express Hub Port 0
03h	01h	00h	Internal	PCI Express Hub Port 1
03h	02h	00h	Internal	PCI Express Hub Port 2
07h (Note2)	00h	00h	Internal	Texas Instrument 3.0 USB Hub
08h	00h	00h	Internal	Realtek Ethernet Controller



1. The PCI Express Ports are visible only if a device is attached behind them to the PCI Express Slot on the base board.
2. This device is only present on some conga-TCA variants.

## 8.5 PCI Interrupt Routing Map

**Table 33** PCI Interrupt Routing Map

PIRQ	PCI BUS INT Line <sup>1</sup>	APIC Mode IRQ	VGA	HDA	EHCI	SM Bus	LAN	UHCI #0	UHCI #1	UHCI #2	PCI-EX Root Port 0	PCI-EX Port 0	PCI-EX Port 1	PCI-EX Port 2	COMx Slot #0	COMx Slot #1	COMx Slot #2	COMx Slot #3
A	INTA	16	x								x	x	x	x				
B	INTB	17									x	x	x	x				
C	INTC	18								x	x	x	x	x				
D	INTD	19				x			x		x	x	x	x				
E		20					x								x	x	x	x
F		21													x	x	x	x
G		22		x											x	x	x	x
H		23			x			x							x	x	x	x



### Note

<sup>1</sup> These interrupt lines are virtual (message based)

## 8.6 I<sup>2</sup>C Bus

There are no onboard resources connected to the I<sup>2</sup>C bus. Address 16h is reserved for congatec Battery Management solutions.

## 8.7 SM Bus

System Management (SM) bus signals are connected to the Intel® CG82NM10 (NM10) PCH and the SM bus is not intended to be used by off-board non-system management devices. For more information about this subject contact congatec technical support.

## 9 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.

### 9.1 Entering the BIOS Setup Program.

The BIOS setup program can be accessed by pressing the <DEL> or <F2> key during POST.

#### 9.1.1 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.

### 9.2 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	Boot	Security	Save & Exit
------	----------	------	----------	-------------

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



#### Note

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

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.

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

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

## 9.3 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 for configuring 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 Rev.	no option	Displays the revision of the congatec board controller.
MAC Address	no option	Displays the MAC address of the onboard Ethernet controller.
Boot Counter	no option	Displays the number of boot-ups. (max. 16777215).
Running Time	no option	Displays the time the board is running [in hours max. 65535].
► Intel RC Version	submenu	Opens the Intel Platform Reference Code Information submenu.
System Date	Day of the week, month/day/year	Specifies the current system date. <i>Note: The date is in month-day-year format.</i>
System Time	Hour:Minute:Second	Specifies the current system time. <i>Note: The time is in 24 hour format.</i>

### 9.3.1 Intel RC Version Submenu

The Intel RC version submenu offers additional hardware and software information.

Feature	Options	Description
Processor	no option	Displays the processor reference Code ID string.
Processor MRC	no option	Displays the processor MRC Reference code version.
Chipset	no option	Displays the NM10 Reference code version.
Processor P-UNIT	no option	Displays the number P-UNI version.
IGD VBIOS Version	no option	Displays the video BIOS version.
ACPI Version	no option	Displays the version of the ACPI Reference Code.
INTEL IFFS	no option	Displays the Intel Fast Flash Standby Reference Code Version.

## 9.4 Advanced Setup

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

Main	Advanced	Boot	Security	Save & Exit
	Graphics			
	Watchdog			
	Hardware Monitoring			
	PCI			
	ACPI			
	RTC Wake			
	CPU			
	Memory			
	Chipset			
	SATA			
	iFFS			
	USB			
	Super IO			
	Console Redirection			
	Network Stack			



## 9.4.1 Graphics Submenu

Feature	Options	Description
Boot Display Device	<b>VBIOS Default</b> CRT LFP DDI CRT + LFP CRT + DDI LFP + DDI	Select the Primary IGD display device(s) to be used during boot up. CRT: selects Analog VGA display port. LFP (Local Flat Panel): selects a LVDS panel connected to the integrated LVDS port. DDI (Digital Display Interface): selects a digital interface HDMI or DP connected to the system.
Active LFP	No LVDS <b>LVDS</b>	Select the active local flat panel configuration.
Always Try Auto Panel Detect	<b>No</b> Yes	If set to 'Yes' the BIOS will first look for an EDID data set in an external EEPROM to configure the Local Flat Panel . Only if no external EDID data set can be found, the data set selected under 'Local Flat Panel Type' will be used as fallback data set.
Local Flat Panel Type	<b>Auto</b> VGA 640x480 1x18 (002h) VGA 640x480 1x18 (013h) WVGA 800x480 1x24 (01Bh) SVGA 800x600 1x18 (01Ah) XGA 1024x768 1x18 (006h) XGA 1024x768 1x24 (008h) WXGA 1280x768 1x24 (01Ch) 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. <i>Note: Customized EDID™ utilizes an OEM defined EDID™ data set stored in the BIOS flash device.</i>
Flat Panel Scaling	<b>Auto</b> Forced Scaling Off Maintain Aspect Ratio	Select the Flat Panel Scaling mode.
Backlight Inverter Type	<b>None</b> PWM I2C	Select the type of backlight Inverter used.
IGD Clock Source	<b>External clock</b> Internal Clock	IGD clock selection
IGD Total Graphics Memory	128MB <b>256MB</b>	Select the amount of total graphics memory that maybe used by the Internal Graphics Device. Memory above the fixed graphics memory will be dynamically allocated by the graphics driver according to DVMT 5.0 specification.
ALS Support	Disabled <b>Enabled</b>	Valid only for ACPI Enable ALS support on the Operating System.
Digital Display Interface 1	<b>Disabled</b> Display Port HDMI/DVI	Select the Digital Display Interface offered by the DDI 1

Feature	Options	Description
Digital Display Interface 2	<b>Disabled</b> Display Port HDMI/DVI	Select the Digital Display Interface offered by the DDI 2
PWM Inverter Frequency	<b>200</b> - 40000	Select PWM inverter frequency. Default 200. Hidden if "Backlight Inverter Type" selected is "None".
PWM Inverter Polarity	<b>No</b> Yes	Allow to invert backlight control values if required for the actual backlight hardware controller. Hidden if "Backlight Inverter Type" selected is "None".
Backlight Setting	0%, 10%, 25%, 40%, 50%, 60%, 75%, 90%, <b>100%</b>	Actual backlight value in percent of the maximum setting. Hidden if Backlight inverter Type is None or I2C.
Inhibit Backlight	<b>No</b> Permanent Until End Of POST	Decide whether the backlight on signal should be activated when the panel is activated or whether it should remain inhibited until the end of BIOS POST or permanently. Hidden if "Backlight Inverter Type" selected is "None".

## 9.4.2 Watchdog Submenu

Feature	Options	Description
POST Watchdog	<b>Disabled</b> 30sec 1min 2min 5min 10min 30min	Select the timeout value for the POST watchdog.  The watchdog is only active during the power-on-self-test of the system and provides a facility to prevent errors during boot up by performing a reset..
Stop Watchdog for User Interaction	No <b>Yes</b>	Select whether the POST watchdog should be stopped during the pop-up boot selection menu or while waiting for setup password insertion.
Runtime Watchdog	<b>Disabled</b> One time trigger Single Event Repeated Event	Selects the operating mode of the runtime watchdog. This watchdog will be initialized just before the operating system starts booting. If set to ' <i>One time trigger</i> ' the watchdog will be disabled after the first trigger. If set to ' <i>Single event</i> ', every stage will be executed only once, then the watchdog will be disabled. If set to ' <i>Repeated event</i> ' the last stage will be executed repeatedly until a reset occurs.
Delay	<b>Disabled</b> 10sec 30sec 1min 2min 5min 10min 30min	Select the delay time before the runtime watchdog becomes active. This ensures that an operating system has enough time to load.
Event 1	ACPI Event <b>Reset</b> Power Button	Selects the type of event that will be generated when timeout 1 is reached. For more information about ACPI Event, see note below.
Event 2	<b>Disabled</b> ACPI Event Reset Power Button	Selects the type of event that will be generated when timeout 2 is reached.

Feature	Options	Description
Event 3	<b>Disabled</b> ACPI Event Reset Power Button	Selects the type of event that will be generated when timeout 3 is reached.
Timeout 1	1sec 2sec 5sec 10sec <b>30sec</b> 1min 2min 5min 10min 30min	Selects the timeout value for the first stage watchdog event.
Timeout 2	see above	Selects the timeout value for the second stage watchdog event.
Timeout 3	see above	Selects the timeout value for the third stage watchdog event.
Watchdog ACPI Event	<b>Shutdown</b> Restart	Select the operating system event that is initiated by the watchdog ACPI event. These options perform 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. For this reason, the congatec BIOS will do one of the following:*

*For Shutdown: An over temperature notification is executed. This causes the OS to shut down in an orderly fashion.*

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

*Additionally, the conga-TCA module does not support the watchdog NMI mode. COM Express type 6 modules do not support the PCI bus and therefore the PCI\_SERR# signal is not available. There is no way to drive a NMI to the processor without the presence of the PCI\_SERR# PCI bus signal.*

## 9.4.3 Hardware Monitoring Submenu

Feature	Options	Description
CPU Temperature	no option	Displays the actual CPU Temperature in °C.
Board Temperature 1	no option	Displays the actual Board Temperature 1 in °C.
Board Temperature 2	no option	Displays the actual Board Temperature 2 in °C.
Board Temperature 3	no option	Displays the actual Board Temperature 3 in °C.
12V Standard	no option	Displays the actual voltage of the 12V Standard power supply.
5V Standby	no option	Displays the actual voltage of the 5V Standby power supply.
CPU Fan Speed	no option	Displays the actual CPU Fan Speed in RPM.
Fan PWM Frequency Mode	<b>Low Frequency</b> High Frequency	Select fan PWM base frequency mode. Low frequency: 35.3Hz High frequency: 22.5kHz
Continuous Tacho Reading	Disabled <b>Enabled</b>	If enabled, the fan tacho pulses are measured continuously instead of once per second. Helps to avoid audible 'pulsing' of the fan as the speed would be set to 100% for a very short time during measurement.
Pulses Per Revolution	1, 2, 3, 4	Select number of pulses per revolution generated by the attached fan.
Automatic Fan Speed Control	<b>Disabled</b> Enabled	Enable hardware fan speed control. Independent from any operating system the fan will be turned on once a certain start temperature is reached and linearly ramped up to the defined maximum speed within the given temperature range.
Fan Control Temperature	<b>CPU Temperature</b> Board Temperature 1 Board Temperature 2 Board Temperature 3	Select which temperature input is used for the automatic fan speed control. Only visible if Automatic Fan Speed Control is enabled.
Start Temperature	30, 40, 50, <b>60</b> , 70, 80, 90, 100°C	At this temperature the fan will be turned on at the defined minimum fan speed. Only visible if Automatic Fan Speed Control is enabled.
Temperature Range	5, 10, 15, 20, 25, <b>30</b> , 40, 55, 80°C	Within this temperature range the fan will ramp up to the defined maximum fan speed. Only visible if Automatic Fan Speed Control is enabled.
Minimum Fan Speed	Fan Off, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, <b>50%</b> , 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 100%	Select minimum/start fan speed to be set when the start temperature of the control slope is reached. Only visible if Automatic Fan Speed Control is enabled.
Maximum Fan Speed	Fan Off, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, <b>100%</b>	Select maximum/end fan speed to be ramped up to until the end temperature of the control slope is reached. Only visible if Automatic Fan Speed Control is enabled.
Fan Always On At Minimum Speed	<b>Disabled</b> Enabled	If enabled, the fan will always run at least at the selected minimum speed, even if the control temperature is below the fan control start temperature. This is to ensure a minimum air flow all the time. Only visible if Automatic Fan Speed Control is enabled.

## 9.4.4 PCI Submenu

Feature	Options	Description
PCI BUS Driver Version	No option	Shows the PCI Bus Driver Version ID Number
<b>PCI Common Settings</b>		
PCI Latency Timer	<b>32</b> , 128, 160, 192, 224, 248 PCI Bus Clocks	Select value to be programmed into PCI latency timer register.
Generate EXCD0/1_PERST#	Disabled 1ms 5ms <b>10ms</b> 50ms 100ms 150ms 200ms 250ms	Select whether the COM Express EXCD0_PERST# and EXCD1_PERST# pins should be driven low during POST or how long it will be, if enabled.
VGA Palette Snoop	<b>Disabled</b> Enabled	Enable or disable VGA palette registers snooping.
PERR# Generation	<b>Disabled</b> Enabled	Enable or disable PCI Device to generate PERR#
SERR# Generation	Disabled Enabled	Enable or disable PCI Device to generate SERR#
Reserve Legacy Interrupt 1	None, IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11	The interrupt reserved here will not be assigned to any PCI or PCI Express device and thus maybe available for some legacy bus device.
Reserve Legacy Interrupt 2	Same as Reserve Legacy Interrupt 1	Same as Reserve Legacy Interrupt 1
► PIRQ Routing & IRQ Reservation	submenu	Manual PIRQ routing and interrupt reservation for legacy devices.

### 9.4.4.1 PIRQ Routing & IRQ Reservation Submenu

Feature	Options	Description
PIRQA	<b>Auto</b> , IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Set interrupt for selected PIRQ. Please refer to the board's resource list for a detailed list of devices connected to the respective PIRQ. NOTE: These settings will only be effective while operating in PIC (non-IOAPIC) interrupt mode.
PIRQB	same as PIRQA	same as PIRQA
PIRQC	same as PIRQA	same as PIRQA
PIRQD	same as PIRQA	same as PIRQA
PIRQE	same as PIRQA	same as PIRQA
PIRQF	same as PIRQA	same as PIRQA
PIRQG	same as PIRQA	same as PIRQA
PIRQH	same as PIRQA	same as PIRQA

### 9.4.5 ACPI Submenu

Feature	Options	Description
ACPI	no option	Describes the ACPI features.
Hibernation Support	Disabled <b>Enabled</b>	Enable or disable system ability to hibernate (operating system S4 sleep state). This option may not be effective with some operating systems.
ACPI Sleep State	Suspend Disabled <b>S3 (Suspend to RAM)</b>	Select the state used for ACPI system sleep/suspend.
Lid Button Support	<b>Disabled</b> Enabled	Configure COM Express LID# signal to act as ACPI lid button.
Sleep Button Support	<b>Disabled</b> Enabled	Configure COM Express SLEEP# signal to act as ACPI sleep button.
S3 Video Repost	<b>Disabled</b> Enabled	Enable or disable video BIOS re-post on S3 resume. Required by some operating systems.
S3 USB Wake	<b>Disabled</b> Enabled	Enable or disable ACPI Wake events generated by USB devices.
CPU Thermal Monitoring	<b>Enable for ACPI and CGOS</b> Enabled for CGOS Disabled	ACPI Monitor will use System Management Interrupts (SMI) for accessing the Digital Thermal Sensor located on a Machine Specific Register (MSR). CGOS access the Digital Thermal Sensor MSR.  <b>Note:</b> Both operations would be problematic for some Operating systems.
Critical Trip Point	POR, 70, 75, 80, 85, 90, 95, 100, 105, 110, <b>115</b> , 120, 125 °C, Disabled	Specifies the temperature threshold at which the ACPI aware OS performs a critical shutdown. The option "POR" is for Cedar Trail Processor at 100° C trip point.
Active Trip Point	55, 60, <b>65</b> , 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125 °C, Disabled	Specifies the temperature threshold at which the ACPI aware OS turns the fan on/off.
Passive Trip Point	55, 60, 65, 70, 75, 80, 85, <b>90</b> , 95, 100, 105, 110, 115, 120, 125 °C, Disabled	Specifies the temperature threshold at which the ACPI aware OS starts or stops CPU clock throttling. This method of Passive cooling is not recommended. The preferred method of passive cooling is the setting of the TCC active offset in CPU Configuration menu.

## 9.4.6 RTC Wake Settings Submenu

Feature	Options	Description
Wake System At Fixed Time	Disabled <b>Enabled</b>	Enable system to wake from S5 using RTC alarm.
Wake Up Hour		Specify wake up hour.
Wake Up Minute		Specify wake up minute.
Wake UP Second		Specify wake up second.

## 9.4.7 CPU Submenu

Feature	Options	Description
<i>CPU Information</i>	no option	Describes the CPU/Processor main parameters
Hyper-Threading	Disabled <b>Enabled</b>	Enable or disable Hyper-Threading support.
Execute Disable Bit	Disabled <b>Enabled</b>	Enable or disable the Execute Disable Bit (XD) of the processor. With the XD bit set to enabled certain classes of malicious buffer overflow attacks can be prevented when combined with a supporting OS.
Limit CPUID Maximum	<b>Disabled</b> Enabled	When enabled, the processor will limit the maximum CPUID input value to 03h when queried, even if the processor supports a higher CPUID input value. When disabled, the processor will return the actual maximum CPUID input value of the processor when queried. Limiting the CPUID input value may be required for older operating systems that cannot handle the extra CPUID information returned when using the full CPUID input value.
EIST	Disabled <b>Enabled</b>	Enable or disable EIST support.
CPU C State Report	Disabled <b>Enabled</b>	Enable or disable CPU C state report to OS.
Enhanced C State	Disabled <b>Enabled</b>	Enable or disable CPU C state.
CPU Hard C4E	Disabled <b>Enabled</b>	Enable or disable CPU Hard C4E state.
CPU C6 State	<b>Disabled</b> Enabled	Enable or disable CPU C state.
C4 Exit Timing	Default <b>Fast</b> Slow	Controls a programmable time for the CPU to stabilize the CPU voltage to stabilize when exiting from a C4 State
C-State POPDOWN	Disabled <b>Enabled</b>	Allows an automatic return to a previous C3/C4 State
C-State POPUP	Disabled <b>Enabled</b>	Allows to take the system from C3/C4 state to C2 state according to bus master request.

## 9.4.8 Memory Submenu

Feature	Options	Description
Memory Information	No option	Show the Memory Information detected by the system
MRC Fast Boot	Disabled <b>Enabled</b>	
MAX TOLUD	<b>Dynamic</b> 1 GB 1.25 GB 1.5 GB 1.75 GB 2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB 3.25 GB 3.5 GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller

## 9.4.9 Chipset Submenu

Feature	Options	Description
► IO Hub Devices	submenu	
► PCI Express Port 0	submenu	Opens the PCI Express Port submenu
► PCI Express Port 1	submenu	Opens the PCI Express Port submenu
► PCI Express Port 2	submenu	Opens the PCI Express Port submenu
► PCI Express Port 3	submenu	Opens the PCI Express Port submenu
DMI Link ASPM Control	Disabled <b>Enabled</b>	Controls the Active State Power Management.
PCI-Exp. High Priority	<b>Disabled</b> Enabled	Selects a PCI Express High Priority Port.
High Precision Timer	Disabled <b>Enabled</b>	Enable or disable High Precision Event Timer
SLP_S4 Assertion Width	<b>1-2 Second</b> 2-3 Second 3-4 Second 4-5 Second	Selects the minimum assertion width of the SLP_S4 Signal.



### 9.4.9.1 IO Hub Devices Submenu

Feature	Options	Description
Azalia Controller	Disabled <b>HD Audio</b>	Controls activation of the HDA controller device. Disabled = HDA controller will be unconditionally disabled HD Audio = HDA controller will be unconditionally enabled
Azalia PME Enable	Disabled <b>Enabled</b>	Enable or disable the Azalia Power Management Events.
Azalia Vci Enable	Disabled <b>Enabled</b>	Enable or disable the Azalia Vci.
Select USB Mode	By Ports <b>By Controllers</b>	Select USM Mode to Control the USB ports
UHCI #1 (Ports 0 and 1)	Disabled <b>Enabled</b>	Enables the USB UHCI (USB 1.1) Controller #1 Only visible if "Select USB Mode" equal "By Controller"
UHCI #2 (Ports 2 and 3)	Disabled <b>Enabled</b>	Enables the USB UHCI (USB 1.1) Controller #2 Only visible if "Select USB Mode" equal "By Controller"
UHCI #3 (Ports 4 and 5)	Disabled <b>Enabled</b>	Enables the USB UHCI (USB 1.1) Controller #3 Only visible if "Select USB Mode" equal "By Controller"
UHCI #4 (Ports 6 and 7)	Disabled <b>Enabled</b>	Enables the USB UHCI (USB 1.1) Controller #4 Only visible if "Select USB Mode" equal "By Controller"
USB Function	Disabled 1 USB Port 2 USB Ports 3 USB Ports 4 USB Ports 5 USB Ports 6 USB Ports 7 USB Ports 8 USB Ports	Enables a concrete number of USB Ports
USB 2.0 (EHCI) Support	Disabled <b>Enabled</b>	Enable or disable USB 2.0 (EHCI) Support.
SMBus Controller	Disabled <b>Enabled</b>	Enable or disable the SMBus Controller.
SIRQ Logic	Disabled <b>Enabled</b>	Enables Serial IRQ Logic.
SIRQ Mode	Quiet <b>Continous</b>	Controls Serial IRQ Mode.

### 9.4.9.2 PCI Express Port Submenu

Feature	Options	Description
PCI Express Port x	Disabled <b>Enabled</b>	Enable or disable the respective PCI Express port x.
Port x I/O APIC	<b>Disabled</b> Enabled	Enable or disable PCI Express Root Port x I/O APIC.
Automatic ASPM	<b>Manual</b> Auto	Automatically enable ASPM based on reported capabilities and known issues.
ASPM L0s	<b>Disabled</b> Root Port Only Endpoint Port Only Both Root And Endpoint Ports	Enable PCIe ASPM L0s
ASPM L1	<b>Disabled</b> Enabled	Enable PCIe ASPM L1.
URR	<b>Disabled</b> Enabled	PCI Express Unsupported Request Reporting Enable/Disable.
FER	<b>Disabled</b> Enabled	PCI Express Device Fatal Error Reporting Enable/Disable.
NFER	<b>Disabled</b> Enabled	PCI Express Device Non-Fatal Error Reporting Enable/Disable.
CER	<b>Disabled</b> Enabled	PCI Express Device Correctable Error Reporting Enable/Disable.
CTO	<b>Disabled</b> Enabled	PCI Express Completion Timer TO Enable/Disable.
SEFE	<b>Disabled</b> Enabled	Root PCI Express System Error on Fatal Error Enable/Disable.
SENFE	<b>Disabled</b> Enabled	Root PCI Express System Error on Non-Fatal Error Enable/Disable.
SECE	<b>Disabled</b> Enabled	Root PCI Express System Error on Correctable Error Enable/Disable.
PME SCI	Disabled <b>Enabled</b>	PCI Express PME SCI Enable/Disable.
Hot Plug	<b>Disabled</b> Enabled	PCI Express Hot Plug Enable/Disable.
Extra Bus Reserved	0-7	Extra Bus Reserved (0-7) for bridges behind this Root Bridge. Default value is 0
Reserved Memory	[1-20]	Reserved Memory and Prefetchable Memory (1-20MB) Range for this Root Bridge. Default Value is 1MB.
Reserved I/O	<b>4K,8K,2K,16K,20K</b>	Reserved I/O (4K/8K/12K/16K/20K) Range for this Root Bridge.

## 9.4.10 SATA Submenu

Feature	Options	Description
SATA Port Information	no option	Displays the name of the connected Hard Disk or DVDROM when the port is enabled. Empty is displayed when the port is enabled but nothing is connected to it.
SATA Controller(s)	<b>Enabled</b> Disabled	Enable or disable the onboard SATA controllers.
Configure SATA as	IDE <b>AHCI</b>	Select SATA controller mode.
Port 0 Speed Limit	<b>No Limit</b> GEN1 Rate GEN2 Rate	Controls the Port 0 Speed Limit.
Port 1 Speed Limit	<b>No Limit</b> GEN1 Rate GEN2 Rate	Controls the Port 1 Speed Limit.
SATA Port 0	<b>Enabled</b> Disabled	Enables Port 0.
SATA Port 0 Hotplug	<b>Enabled</b> Disabled	Configures this Port as Hot Pluggable.
SATA Port 1	<b>Enabled</b> Disabled	Enables Port 1.
SATA Port 1 Hotplug	<b>Enabled</b> Disabled	Configures this Port as Hot Pluggable.
SMART Self Test	<b>Disabled</b> Enabled	Run SMART self Test on all Hard Disk during POST.

## 9.4.11 iFFS Submenu

Feature	Options	Description
IFFS Support	<b>Disabled</b> Enabled	Indicates support for Intel Fast Flash Standby.

## 9.4.12 USB Submenu

Feature	Options	Description
USB Devices	no option	Displays the detected USB devices.
Legacy USB Support	<b>Enabled</b> Disabled Auto	Enables legacy USB support. Auto option disables legacy support if no USB devices are connected. Disable option will keep USB devices available only for EFI applications and setup.
EHCI Hand-off	Disabled <b>Enabled</b>	This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by the EHCI OS driver.
Device Reset Timeout	10 sec <b>20 sec</b> 30 sec 40 sec	USB legacy mass storage device Start Unit command timeout.
USB Transfer Timeout	1 sec 5 sec 10 sec <b>20 sec</b>	The timeout value for control, bulk, and interrupt transfers.
Device Power-Up Delay Selection	<b>Auto</b> Manual	Define maximum time a USB device might need before it properly reports itself to the host controller. Auto selects a default value which is 100ms for a root port or derived from the hub descriptor for a hub port.
Device Power-Up Delay Value	0-40 Default : <b>5</b>	Actual power-up delay value in seconds.
USB Mass Storage Device Name (Auto detected USB mass storage devices are listed here dynamically)	<b>Auto</b> Floppy Forced FDD Hard Disk CD-ROM	<p>Every USB mass storage device that is enumerated by the BIOS will have an emulation type setup option. This option specifies the type of emulation the BIOS has to provide for the device.</p> <p><i>Note: The device's formatted type and the emulation type provided by the BIOS must match for the device to boot properly.</i></p> <p>Select <i>AUTO</i> to let the BIOS auto detect the current formatted media.</p> <p>If Floppy is selected then the device will be emulated as a floppy drive.</p> <p><i>Forced FDD</i> allows a hard disk image to be connected as a floppy image. Works only for drives formatted with FAT12, FAT16 or FAT32.</p> <p><i>Hard disk</i> allows the device to be emulated as hard disk.</p> <p><i>CDROM</i> assumes the CD-ROM is formatted as bootable media, specified by the 'El Torito' Format Specification.</p>

### 9.4.13 Super I/O Submenu

Feature	Options	Description
Serial Port 0	Disabled <b>Enabled</b>	Enable or disable serial port 0.
Device Settings	IO=3F8h; IRQ=4;	Fixed configuration of serial port 0 if enabled.
Serial Port 1	Disabled <b>Enabled</b>	Enable or disable serial port 1.
Device Settings	IO=2F8h; IRQ=3;	Fixed configuration of serial port 1 if enabled.
Parallel Port	<b>Disabled</b> Enabled	Enable or disable parallel port.
Device Settings	IO=378h; IRQ=7;	Fixed configuration of the parallel port if enabled.
Device Mode	<b>Standard Parallel Mode</b> EPP Mode ECP Mode EPP Mode & ECP Mode	Set the parallel port mode.



*This setup menu is only available if an external Winbond W83627 Super I/O has been implemented on the carrier board.*

### 9.4.14 Console Redirection Submenu

Feature	Options	Description
COM0 Console Redirection	<b>Disabled</b> Enabled	Enable or disable serial port 0 console redirection.
► Console Redirection Settings	submenu	Opens console redirection configuration sub menu.
COM1 Console Redirection	<b>Disabled</b> Enabled	Enable or disable serial port 1 console redirection.
► Console Redirection Settings	submenu	Opens console redirection configuration sub menu.
<b>Serial Port for Out-of-Band management/Windows Emergency management Services (EMS)</b>		
Console Redirection	<b>Disabled</b> Enabled	Enable Console Redirection Settings setup Node for EMS.
► Console Redirection Settings	submenu	

#### 9.4.14.1 Console Redirection Settings Submenu

Feature	Options	Description
Terminal Type	VT100 VT100+ VT-UTF8 <b>ANSI</b>	Select terminal type.
Baud rate	9600, 19200, 38400, 57600, <b>115200</b>	Select baud rate.
Data Bits	7, <b>8</b>	Set number of data bits.
Parity	<b>None</b> Even Odd Mark Space	Select parity.
Stop Bits	<b>1</b> 2	Set number of stop bits.
Flow Control	<b>None</b> Hardware RTS/CTS	Select flow control.
Recorder Mode	<b>Disabled</b> Enabled	With recorder mode enabled, only text output will be sent over the terminal. This is helpful to capture and record terminal data.
Resolution 100x31	<b>Disabled</b> Enabled	Enables or disables extended terminal resolution in UEFI environment.
Legacy OS Redirection Resolution	<b>80x24</b> 80x25	Number of rows and columns supported for legacy OS redirection.

#### 9.4.14.2 Console Redirection Settings (EMS) Submenu

Feature	Options	Description
Out-of-Band Mgmt Port	<b>COM0</b> COM1	Select serial port for Windows emergency Management Services (EMS) .
Terminal Type	VT100 VT100+ <b>VT-UTF8</b> ANSI	Select terminal type.
Baud rate	9600, 19200, 38400, 57600, <b>115200</b>	Select baud rate.
Flow Control	<b>None</b> Hardware RTS/CTS	Select flow control.
Data Bits	<b>8</b>	no option
Parity	<b>None</b>	no option
Stop Bits	<b>1</b>	no option

## 9.4.15 Network Stack Submenu

Feature	Options	Description
Network Stack	Disabled <b>Enabled</b>	Enable/Disable the Network Stack for UEFI.
Ipv4 PXE Support	Disabled <b>Enabled</b>	Enable Ipv4 PXE Boot Support. If disabled Ipv4 PXE Boot option will not be created
Ipv6 PXE Support	Disabled <b>Enabled</b>	Enable Ipv6 PXE Boot Support. If disabled Ipv6 PXE Boot option will not be created

## 9.5 Boot Setup

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

### 9.5.1 Boot Settings Configuration

Feature	Options	Description
Setup Prompt Timeout	<b>1</b> 0 - 65535	Number of seconds to wait for setup activation key. 0 means no wait for fastest boot, 65535 means infinite wait.
Bootup NumLock State	<b>On</b> Off	Select the keyboard numlock state.
System Off Mode	<b>G3/Mech Off</b> S5/Soft Off	Define system state after shutdown when a battery system is present.
Quiet Boot	<b>Disabled</b> Enabled	Disabled displays normal POST diagnostic messages. Enabled displays OEM logo instead of POST messages. <b>NOTE:</b> The default OEM logo is a dark screen.
Power Loss Control	<b>Remain Off</b> Turn On Last State	Specifies the mode of operation if an AC power loss occurs. Remain Off keeps the power off until the power button is pressed. Turn On restores power to the computer. Last State restores the previous power state before power loss occurred. <i>Note: Only works with an ATX type power supply.</i>
AT Shutdown Mode	<b>System Reboot</b> Hot S5	Determines the system's behavior, when shutting down the system working on AT Mode. The system can reboot or stay on a Hot S5 power state. When the system is ATX powered, this setup node has no effect.
CPU Reset Mode	<b>Warm Reset</b> Cold Reset	Select the type of reset to be initiated by the Reset Control Register (0xCF9). Warm reset performs a CPU soft reset. Cold reset performs a full hard reset (power off/on reset).
Boot Logo	Disabled Enabled <b>Auto</b>	If Disabled, no congatec OEM boot logo shows during POST. The system shows only POST strings and congatec boot logo. If Enabled, a congatec OEM logo or a black screen shows during POST. The black screen shows only if the OEM logo is not found. If Auto, a congatec OEM boot logo loads if present. If no OEM boot logo is found, the system shows POST strings and congatec boot logo.

Feature	Options	Description
Enter Setup If No Boot Device	<b>No</b> Yes	Select whether the setup menu should start if no boot device is connected.
Enable Popup Boot Menu	No <b>Yes</b>	Select whether the popup boot menu starts.
Boot Priority Selection	Device Based <b>Type Based</b>	Select between device and type based boot priority lists. The "Device Based" boot priority list allows you to select from a list of currently detected devices only. The "Type Based" boot priority list allows you to select device types, even if a respective device is not yet present. Moreover, the "Device Based" boot priority list might change dynamically in cases when devices are physically removed or added to the system. The "Type Based" boot menu is static and can only be changed by the user.
1st, 2nd, 3rd, ... Boot Device  (Up to 12 boot devices can be prioritized if device based 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 Primary Master Primary Slave Secondary Master Third Master Fourth Master USB Floppy USB Harddisk USB CDROM Onboard LAN External LAN Other BEV Device	This view is only available when in the default "Type Based" mode.  When in "Device Based" mode you will only see the devices that are currently connected to the system.
► CSM & Option ROM Parameters	submenu	

### Note

1. The term 'AC power loss' stands for the state when the module loses the standby voltage on the 5V\_SB pins. On congatec modules, the standby voltage is continuously monitored after the system is turned off. If within 30 seconds the standby voltage is no longer detected, then this is considered an AC power loss condition. If the standby voltage remains stable for 30 seconds, then it is assumed that the system was switched off properly.
2. 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.



### 9.5.1.1 CSM & Option ROM Parameters Submenu

Feature	Options	Description
Launch CSM	<b>Always</b> Never	Controls if CSM will be launched.
Boot Option filter	UEFI and Legacy <b>Legacy Only</b> UEFI only	This option controls what devices system can boot to.
PXE OpROM Launch Policy	Do not launch <b>UEFI Only</b> Legacy Only	Controls the execution of UEFI and Legacy PXE OpROM.
Storage OpROM Launch Policy	Do not launch UEFI Only <b>Legacy Only</b> Legacy ROM First UEFI ROM First	Controls the execution of UEFI and Legacy Storage OpROM.
Video OpROM Launch Policy	Do not launch UEFI Only <b>Legacy Only</b> Legacy ROM First UEFI ROM First	Controls the execution of UEFI and Legacy Video OpROM.
Other OpROM Launch Policy	UEFI OpROM <b>Legacy OpROM</b>	For PCI devices other than Network, Mass storage or Video defines which OpROM to launch.
GateA20 Active	<b>Upon Request</b> Always	Gate A20 control. Upon Request = Gate A20 can be disabled using BIOS services. Always = Do not allow disabling Gate A20
Option ROM Messages	<b>Force BIOS</b> Keep Current	Set display mode for option ROMs.
INT19 Trap Response	<b>Immediate</b> Postponed	BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.

## 9.6 Security Setup

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

### 9.6.1 Security Settings

Feature	Options	Description
Administrator Password	enter password	Specifies the setup administrator password.
► Trusted Computing	submenu	Trusted computing Settings
<b>HDD Security Configuration</b>		
<i>List of all detected hard disks supporting the security feature set</i>	Select device to open device security configuration submenu	

#### 9.6.1.1 Trusted Computing

Feature	Options	Description
Security Device Support	Enable <b>Disable</b>	Enable or disable security device. NOTE: Your computer will reboot during restart in order to change the state of the device.

### 9.6.2 Hard Disk Security

This feature enables the users to set, reset or disable passwords for each hard drive in Setup without rebooting. 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.

### 9.6.3 Save & Exit Menu

Select the Save & Exit tab from the setup menu to enter the Save & Exit setup screen.

You can display an Save & Exit screen option by highlighting it using the <Arrow> keys.

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.
<b>Save Options</b>	
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.

## 10 Additional BIOS Features

The conga-TCA 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 TCEDR1xx where TCED is the congatec internal project name, R is the identifier for a BIOS ROM file, 1 is the so called feature number and xx is the major and minor revision number.

The size of the conga-TCA BIOS binary is approximately 4MB.

### 10.1 Supported Flash Devices

The conga-TCA supports the following flash devices:

- Atmel AT25DF321-SU
- Greenliant Systems SST25VF032B-66-4I-S2AF
- Macronix MX25L3206EM2I-12G

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>.

### 10.2 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](http://www.congatec.com).

### 10.3 BIOS Security Features

The BIOS provides a setup administrator password that limits access to the BIOS setup menu.

## 10.4 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.

# 11 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)	<a href="http://developer.intel.com/design/chipsets/industry/lpc.htm">http://developer.intel.com/design/chipsets/industry/lpc.htm</a>
Universal Serial Bus (USB) Specification, Revision 2.0	<a href="http://www.usb.org/home">http://www.usb.org/home</a>
PCI Specification, Revision 2.3	<a href="http://www.pcisig.com/specifications">http://www.pcisig.com/specifications</a>
Serial ATA Specification, Revision 3.0	<a href="http://www.serialata.org">http://www.serialata.org</a>
PICMG® COM Express Module™ Base Specification	<a href="http://www.picmg.org/">http://www.picmg.org/</a>
PCI Express Base Specification, Revision 1.0a	<a href="http://www.pcisig.com/specifications">http://www.pcisig.com/specifications</a>