BOLT

USER MANUAL

UDOO BOLT

Next-gen Open hardware SBC with the
AMD Ryzen™ Embedded V1000 Processors

www.udoo.org

REVISION HISTORY

Revision	Date	Note	Ref
0.1	12 December 2018	First Internal Release.	SB
0.2	12 December 2018	R&D review suggestions applied	SB
0.3	13 December 2018	LEDs and buttons descriptions added	SB
0.4	18 December 2018	Power consumptions REV B updated	SB

To get the required assistance for any and possible issues, please contact us using the dedicated web form available at http://www.udoo.org/customer-care/open.php.

Our team is ready to assist.

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Chapter 1.
INTRODUCTION

- Warranty
- Information and assistance
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1.1 Warranty

This product is subject to the Italian Law Decree 24/2002, acting European Directive 1999/44/CE on matters of sale and warranties to consumers.

The warranty on this product lasts for 2 years.

Under the warranty period, the Supplier guarantees the buyer assistance and service for repairing, replacing or credit of the item, at the Supplier's own discretion.

Items cannot be returned unless previously authorized by the supplier.

The authorization is released after completing the specific form available on the web-site http://www.udoo.org/customer-care/ (Open a New Ticket → Return Merchandise Application). The RMA authorization number must be put both on the packaging and on the documents shipped with the items, which must include all the accessories in their original packaging, with no signs of damage to, or tampering with, any returned item.

The error analysis form identifying the fault type must be completed by the customer and has must accompany the returned item.

Following a technical analysis, the supplier will verify if all the requirements, for which a warranty service applies, are met. If the warranty cannot be applied, the Supplier will calculate the minimum cost of this initial analysis on the item and the repair costs. Costs for replaced components will be calculated separately.

Warning!
All changes or modifications to the equipment not explicitly approved by SECO S.p.A. could impair the equipment's functionalities and could void the warranty

1.2 Information and assistance

What do I have to do if I'm experiencing problems with my product?

The following services are available:

- UDOO website: visit http://www.udoo.org to receive the latest information on the product. In most cases it is possible to find useful information to solve the problem.
- UDOO Forum: join to the community of UDOO users. In the forum, available at http://www.udoo.org/forum/, it is possible to search the multiple topics of the community, and look for other users that had the same kind of problem - and how they solved it. It is also possible to post new topics to ask for specific help.
- Repair centre: it is possible to send the faulty product to the SECO Repair Centre. In this case, follow this procedure:
  - Returned items must be accompanied by a RMA Number. Items sent without the RMA number will be not accepted.
  - Returned items must be shipped in an appropriate package. SECO is not responsible for damages caused by accidental drop, improper usage, or customer neglect.

Note: Please have the following information before asking for technical assistance:

- Name and serial number of the product;
- Description of Customer's peripheral connections;
- Description of Customer's software (operating system, version, application software, etc.);
- A complete description of the problem;
- The exact words of every kind of error message encountered.

1.3 RMA number request

To request a RMA number, please visit UDOO web-site. On the bottom of the page, please select "Customer Care", click on the "Open a New ticket" button and.

A RMA Number will be sent within 1 working day (only for on-line RMA requests).

1.4 Safety

The UDOO BOLT board uses only extremely-low voltages.

While handling the board, please use extreme caution to avoid any kind of risk or damages to electronic components.

!

This product should be operated in a well-ventilated environment and, if used inside a case, the case should not be covered.

This product should be elevated on a stable, flat, electrically non-conductive surface whilst in operation, and clear from any object that can induce a short-circuit.

Do not expose it to water, moisture or heat from any source; UDOO BOLT is designed for reliable operation at normal ambient room temperatures.

Avoid handling the warm and moving parts (like the fan) and generally the printed circuit board while it is powered

CE certification retained using only the UDOO BOLT qualified Power Supply. When not using UDOO BOLT qualified Power Supply, use 19VDC (min 60W power) PSUs certified for your country (make sure that the power cable is less than 3 mt. long).

1.5 Electrostatic discharges

The UDOO BOLT board, like any other electronic product, is an electrostatic sensitive device: high voltages caused by static electricity could damage some or all the devices and/or components on-board.

!

Only handle by the edges to minimise the risk of electrostatic discharge damage.

Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and connectors. Also use a grounded wrist strap or touch a safely grounded object before you handle components.

1.6 RoHS compliance

The UDOO BOLT board is designed using RoHS compliant components and is manufactured on a lead-free production line. It is therefore fully RoHS compliant.

1.7 FCC certification

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Warning!
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all nearby persons.

SECO S.p.A.
Model: UDOO BOLT xxxxxxx
FCC ID: xxxxxxx
IC: xxxxxxx

1.8 ISED certification

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

(1) This device may not cause interference

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Ce dispositif a été conçu pour fonctionner avec les antennes fournies avec ce produit. L'utilisation d'autres antennes peut enfreindre les règles industrielles du Canada et annuler l'autorité de l'utilisateur quant au fonctionnement de l'équipement.

This device complies with RSS-210, ICES-3(B)/NMB-3(B)

1.9 Terminology and definitions

ACPI	Advanced Configuration and Power Interface, an open industrial standard for the board's devices configuration and power management
AHCI	Advanced Host Controller Interface, a standard which defines the operation modes of SATA interface
API	Application Program Interface, a set of commands and functions that can be used by programmers for writing software for specific Operating Systems
BIOS	Basic Input / Output System, the Firmware Interface that initializes the board before the OS starts loading
CEC	Consumer Electronics Control, an HDMI feature which allows controlling more devices connected together by using only one remote control
DDC	Display Data Channel, a kind of I2C interface for digital communication between displays and graphics processing units (GPU)
DDR	Double Data Rate, a typology of memory devices which transfer data both on the rising and on the falling edge of the clock
DDR4	DDR, 4^{th} generation
EC	Embedded Controller
GbE	Gigabit Ethernet
Gbps	Gigabits per second
GND	Ground
GPI/O	General purpose Input/Output
HD Audio	High Definition Audio, most recent standard for hardware codecs developed by Intel® in 2004 for higher audio quality
HDMI	High Definition Multimedia Interface, a digital audio and video interface
I2C Bus	Inter-Integrated Circuit Bus, a simple serial bus consisting only of data and clock line, with multi-master capability
M.2	Specifications for internal expansion modules, which defines many pinouts and sizes for different purposes. Can include SATA, PCI Express, USB, UART, DP interfaces
Mbps	Megabits per second
MMC/eMMC	MultiMedia Card / embedded MMC, a type of memory card, having the same interface as the SD card. The eMMC is the embedded version of the MMC. They are devices that incorporate the flash memories on a single BGA chip.
N.A.	Not Applicable
N.C.	Not Connected
OpenCL	Open Computing Language, a software library based on C99 programming language, conceived explicitly to realise parallel computing using Graphics Processing Units (GPU)
OpenGL	Open Graphics Library, an Open Source API dedicated to 2D and 3D graphics
OS	Operating System

PCI-e	Peripheral Component Interface Express
PSU	Power Supply Unit
PWM	Pulse Width Modulation
PWR	Power
PXE	Preboot Execution Environment, a way to perform the boot from the network ignoring local data storage devices and/or the installed OS
SATA	Serial Advance Technology Attachment, a differential full duplex serial interface for Hard Disks
SD	Secure Digital, a memory card type
SDHC	Secure Digital Host Controller
SDIO	Secure Digital Input/Output, an evolution of the SD standard that allows the use of the same SD interface to drive different Input/Output devices, like cameras, GPS, Tuners and so on
SM Bus	System Management Bus, a subset of the I2C bus dedicated to communication with devices for system management, like a smart battery and other power supply-related devices
SPI	Serial Peripheral Interface, a 4-Wire synchronous full-duplex serial interface which is composed of a master and one or more slaves, individually enabled through a Chip Select line
TBM	To Be Measured
TDP	Thermal Design Power, an indication of the amount of heat generated by the processor that must be used for the design of the thermal solution.
TMDS	Transition-Minimized Differential Signaling, a method for transmitting high speed serial data, normally used on DVI and HDMI interfaces
UEFI	Unified Extensible Firmware Interface, a specification defining the interface between the OS and the board's firmware. It is meant to replace the original BIOS interface
UMA	Unified Memory Architecture, synonym of Integrated Graphics, uses a portion of a computer's system RAM dedicated to graphics rather than using dedicated graphics memory only.
USB	Universal Serial Bus
V_REF	Voltage reference Pin
xHCI	eXtensible Host Controller Interface, Host controller for USB 3.0 ports, which can also manage USB 2.0 and USB1.1 ports

1.10 Reference specifications

Here below it is a list of applicable industry specifications and reference documents.

Reference	Link
ACPI	http://www.acpi.info
AHCI	http://www.intel.com/content/www/us/en/io/serial-ata/ahci.html
DDC	http://www.vesa.org
Gigabit Ethernet	http://standards.ieee.org/about/get/802/802.3.html
HD Audio	http://www.intel.com/content/dam/www/public/us/en/documents/product-specifications/high-definition-audio-specification.pdf
HDMI	http://www.hdmi.org/index.aspx
I2C	http://www.nxp.com/documents/other/UM10204_v5.pdf
Intel® Front Panel I/O connectivity DG	http://www.formfactors.org/developer/specs/A2928604-005.pdf
M.2	http://pcisig.com/specifications
MMC/eMMC	http://www.jedec.org/committees/jc-649
OpenCL	http://www.khronos.org/opencl
OpenGL	http://www.opengl.org
PCI Express	http://www.pcisig.com/specifications/pciexpress
SATA	https://www.sata-io.org
SD Card Association	https://www.sdcard.org/home
SM Bus	http://www.smbus.org/specs
TMDS	http://www.siliconimage.com/technologies/tmds
UEFI	http://www.uefi.org
USB 2.0 and USB OTG	http://www.usb.org/developers/docs/usb_20_070113.zip
USB 3.0	http://www.usb.org/developers/docs/usb_30_spec_070113.zip
xHCI	http://www.intel.com/content/www/us/en/io/universal-serial-bus/extensible-host-controler-interface-usb-xhci.html?wapkw=xhci
AMD Ryzen™ Embedded V1000	https://www.amd.com/en/products/embedded-ryzen-v1000-series

Chapter 2.
OVERVIEW

- Introduction
- Technical specifications
- Electrical specifications
- Mechanical specifications
- Block diagram

2.1 Introduction

The UDOO BOLT is a portable, breakthrough supercomputer that goes up to 3.6 GHz thanks to the brand-new AMD Ryzen™ Embedded V1000 SoC, a top-notch, multicore CPU with a powerful mobile GPU - AMD Radeon™ Vega 8 or AMD Radeon™ Vega 3 Graphics, the most incredible GPUs ever seen on a maker platform – and an Arduino™ Leonardo compatible platform, all wrapped into one.

The UDOO BOLT can mount a Dual-Core Quad-Thread or a Quad-Core eight-thread SoCs, base frequency 2.3 or 2.0 GHz, Turbo boost at 3.2 or 3.6 GHz, with 64-bit instruction set and very low TDP. This single chip solution includes the memory controller, which gives support for up to 32GB of DDR4 memory on two SO-DIMM Slots, also capable of supporting ECC memory.

All SoCs embed an AMD Radeon™ Vega Graphics controller, with 3 or 8 Execution units, which offers extremely high graphical performances, supporting also High Dynamical range (HDR) Imaging. DirectX® 12, EGL 1.4, OpenCL™ 2.1, OpenGL® ES 1.1/ 2.x / 3.x (Halti), OpenGL® Next (Vulkan®), OpenGL® 4.6 are also supported by this GPU, which can also offer H.265 10-bit video decoding and 8-bit encoding.

Finally, this embedded GPU is able to drive four 4K independent displays, by using the HDMI and the USB-C interfaces available.

Other features offered by the AMD Ryzen™ Embedded V1000 SoCs, and included in UDOO BOLT board, are two SATA Revision 3.0 Channels (one used for the common SATA / SSD drives, the other used to implement a M.2 Socket 2 Key B SSD slot), six USB ports (two USB 3.1 on standard Type-A sockets, two USB 3.1 on standard type-C sockets supporting Display Port Alternate Mode and Power Delivery functions, one USB 2.0 on M.2 Socket 1 Key E Connectivity slot and another USB 2.0 port used for the communications with the Atmega32u4 microcontroller), HD Audio and eight PCI Express lanes (two lanes are carried out on M.2 Socket 2 Key B SSD slot where they can be used as a single PCI-e x2 port, a PCI express lane is used for the implementation of the Gigabit Ethernet interface, ,another is available on M.2 Socket 1 Key E Connectivity Slot and four PCI-express Graphics lanes are carried to the M.2 Key M Slot for NVMe SSDs, where they can be used as a single PCI-e x 4 port).

Through the AMD Ryzen™ Embedded V1000 SoC's USB interface #5 pass all the communications with the ATMEL ATmgea32u4 microcontroller, which implements the Arduino™ Leonardo interface: this situation reproduces exactly the situation of an external Arduino™ board connected to an x86 PC, with the advantages given by an integrated board solution.

All these features, combined together, make UDOO BOLT the most powerful maker board ever.

Please refer to following chapter for a complete list of all the integrated peripherals and the characteristics.

2.2 Technical specifications

SoC

AMD Ryzen™ Embedded V1605B with AMD Radeon™ Vega 8 Graphics, Quad Core Dual Thread @ 2.0GHz (3.6 Boost), TDP 12-25W
AMD Ryzen™ Embedded V1202B with AMD Radeon™ Vega 3 Graphics, Dual Core Dual Thread @ 2.3GHz (3.2 Boost), TDP 12-25W

Memory

2x DDR4 SO-DIMM Slots, supporting DDR4-2400 ECC and non-ECC memory

Graphics

AMD Radeon Vega GPU with 8 (V1605B) or 3 (V1202B) Compute Units
4 independent displays supported
DirectX® 12, EGL1.4, OpenCL™ 2.1, OpenGL® ES 1.1/ 2.x / 3.x (Halti), OpenGL® Next (Vulkan®), OpenGL® 4.6 supported
H.265 (10-bit) decode and 8-bit video encode
VP9 decode

Video Interfaces

2x HDMI connector, supporting HDMI 1.4 / HDMI 2.0a
2x DP alternate mode interfaces on USB Type-C connectors

Video Resolution

Up to 4K

Mass Storage

32GB eMMC 5.0 drive on-board
SATA 6Gb/s 7p M connector
M.2 Key B SATA SSD slot (Type 2242 or 2260 modules accepted)
M.2 Key M NVMe Slot (PCI-e x4 Gen3 interface)

Networking

Realtek RTL811G Gigabit Ethernet controller
Gigabit Ethernet LAN interface
M.2 Key E Slot for optional Wireless modules
M.2 Key B Slot for optional 2x GbEthernet

USB

2x USB 3.1 Host ports on Type-A sockets
2x USB 3.1 Host ports on Type-C sockets, with DisplayPort Alternate Mode and Power Delivery Role
1 x USB 2.0 Host port on M.2 Key E slot

PCI-Express

1 x PCI-e x2 port on M.2 Key B SSD Slot
1 x PCI-e x1 port on M.2 Key E slot
1 x PCI-e x4 port on M.2 Key M Slot

Audio

HD Audio Codec Realtek ALC888S
Combo TRSS connector with Mic In and Line out support
S/PDIF or additional headphone signal
2 x Speaker internal headers

Other Interfaces

I2C Grove connectors
Switch/LED Front Panel Header
CIR (Consumer InfraRed) Sensor
Arduino™ Leonardo compatible interface
Embedded controller I/O header with 2x UART, SPI, 2x I2C, FAN Control, Keyboard Scan or GPI/O signals

Power supply: +19V_{DC} ± 5% DC Power Jack
USB Type-C Power In
RTC Coin cell Battery

Operating temperature: 0°C ÷ +50°C** (Commercial temperature)

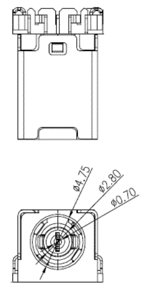
Dimensions: 120 x 120 mm (4.72” x 4.72”).

Supported Operating Systems:

Microsoft® Windows 10
Any Linux distribution for X86 64-bit platform

! *** Environmental temperature, measured using UDOO BOLT Standard heatsink with Fan*

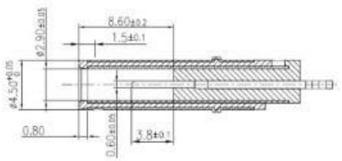
2.3 Electrical specifications



The UDOO BOLT board can be supplied only with an external 19V$_{DC}$ ± 5% power supply, minimum 60W (i.e. min. 3.15A @ 19V) for basic functionalities recommended. Always make sure that the power cable is less than 3mt. long.

This voltage can be supplied through a DC power jack (CN5) type Singatron p/n 2DC3122-007111F. Internal pin is V$_{IN}$ power line.

Mating DC plug as shown in the picture below (Singatron p/n 45P06CV230-1A00-01 or equivalent).



The Board can also be powered by using a standard USB-C power adapter, with the same minimum wattage (power profile: 20V 3A).

A bicolour Green/Yellow LED is placed near the DC IN power jack to signal the power state of the board. When the board is powered but turned off, then the LED turns on Yellow, during normal working (S0 State) the LED turns on Green light.

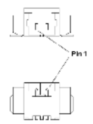
2.3.1 RTC Battery

For the occurrences when the module is not powered with an external power supply, on board there is a cabled coin Lithium Battery to supply, with a 3V voltage, the Real Time Clock embedded inside the AMD Ryzen™ Embedded V1000 SoC.

Battery used is a cabled CR2032-LD Lithium coin-cell battery, with a nominal capacity of 220mAh.

Battery connector – CN4	
Pin	**Signal**
1	V$_{RTC}$
2	GND

The battery is not rechargeable, and can be connected to the board using dedicated connector CN5 which is a 2-pin p1.27 mm type MOLEX p/n 53261-0271 or equivalent, with pinout shown in the table on the left.



Mating connector: MOLEX 51021-0200 receptacle with MOLEX 50079-8000 female crimp terminals.

In case of exhaustion, the battery should only be replaced with devices of the same type. Always check the orientation before inserting and make sure that they are aligned correctly and are not damaged or leaking.

Never allow the batteries to become short-circuited during handling.

! **CAUTION**: handling batteries incorrectly or replacing with not-approved devices may present a risk of fire or explosion.

Batteries supplied with UDOO BOLT are compliant to requirements of European Directive 2006/66/EC regarding batteries and accumulators. When putting out of order UDOO BOLT, remove the batteries from the board in order to collect and dispose them according to the requirement of the same European Directive above mentioned. Even when replacing the batteries, the disposal has to be made according to these requirements.

2.3.2 Power consumption

Using the following setup, and using all possible SoCs offered for UDOO BOLT board, the current consumption (RMS) has been measured on the V_{IN} Power line. The board is supplied with a 19V voltage through DC power jack CN4 using a Keysight DC Power Analyzer model N6700B.

- O.S. Windows 10 Professional
- 32GB eMMC onboard
- 8GB DDR4-2133 Single Channel Memory
- USB mouse and keyboard connected
- HDMI display connected
- UEFI BIOS Release 1.00 RC 03

Status	SoC V1202B			
	TDP 12W		TDP 25W	
	Average (120s)	Peak	Average (120s)	Peak
Idle, power saving configuration	0.357A	0.704A	0.327A	0.674A
OS Boot, power saving configuration	0.838A	1.388A	0.851A	1.450A
Video reproduction@1080p, power saving configuration	0.712A	0.983A	0.722A	1.230A
Video reproduction@4K, power saving configuration	0.822A	1.363A	0.753A	1.380A
Internal Stress Test Tool, package power set at specific TDP	1.411A	1.480A	1.348A	1.634A

Status	SoC V1605B			
	TDP 12W		TDP 25W	
	Average (120s)	Peak	Average (120s)	Peak
Idle, power saving configuration	0.345A	0.752A	0.341A	0.635A
OS Boot, power saving configuration	0.797A	1.608A	0.780A	1.899A
Video reproduction@1080p, power saving configuration	0.666A	1.156A	0.593A	1.072A
Video reproduction@4K, power saving configuration	0.847A	1.308A	0.778A	1.424A
Internal Stress Test Tool, package power set at specific TDP	1.293A	1.485A	1.506A	1.943A

Independently by the SoC mounted onboard, the following power consumptions are common to all boards:

Battery Backup power consumption: 3.68μA
Soft-Off State power consumption: TBM
Suspend State power consumption: TBM

Please consider that the power consumption depends strongly on the utilization scenario.

2.3.3 Power rails naming convention

In all the tables contained in this manual, Power rails are named with the following meaning:

_RUN: Switched voltages, i.e. power rails that are active only when the board is in ACPI's S0 (Working) state. Examples: +3.3V_RUN, +5V_RUN.

_ALW: Always-on voltages, i.e. power rails that are active both in ACPI's S0 (Working), S3 (Standby) and S5 (Soft Off) state. Examples: +5V_ALW, +3.3V_ALW.

_DSW: Deep Sleep Well voltage, i.e. power rails that remain active also when the _ALW voltages have been turned off, in a state very similar to the Mechanical Off (G3) but with the possibility of awakening of the module upon a very limited set of events. It is not supported by UDOO Bolt firmware, however.

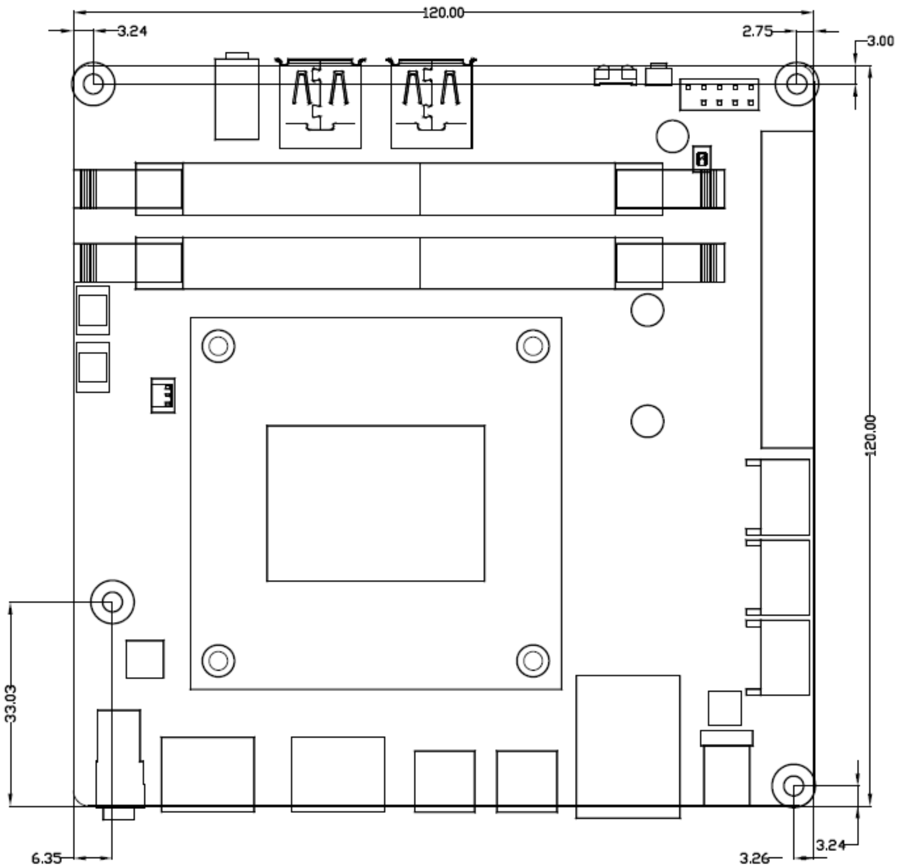
_SUS: unswitched ACPI S3 voltages, i.e. power rails that are active both in ACPI's S0 (Working) and S3 (Standby) state. Examples: +1.5V_SUS

Other suffixes are used for application specific power rails, which are derived from same voltage value of voltage switched rails, if it is not differently stated (for example, $+5V_{HDMI}$ is derived from +5V_RUN, and so on).

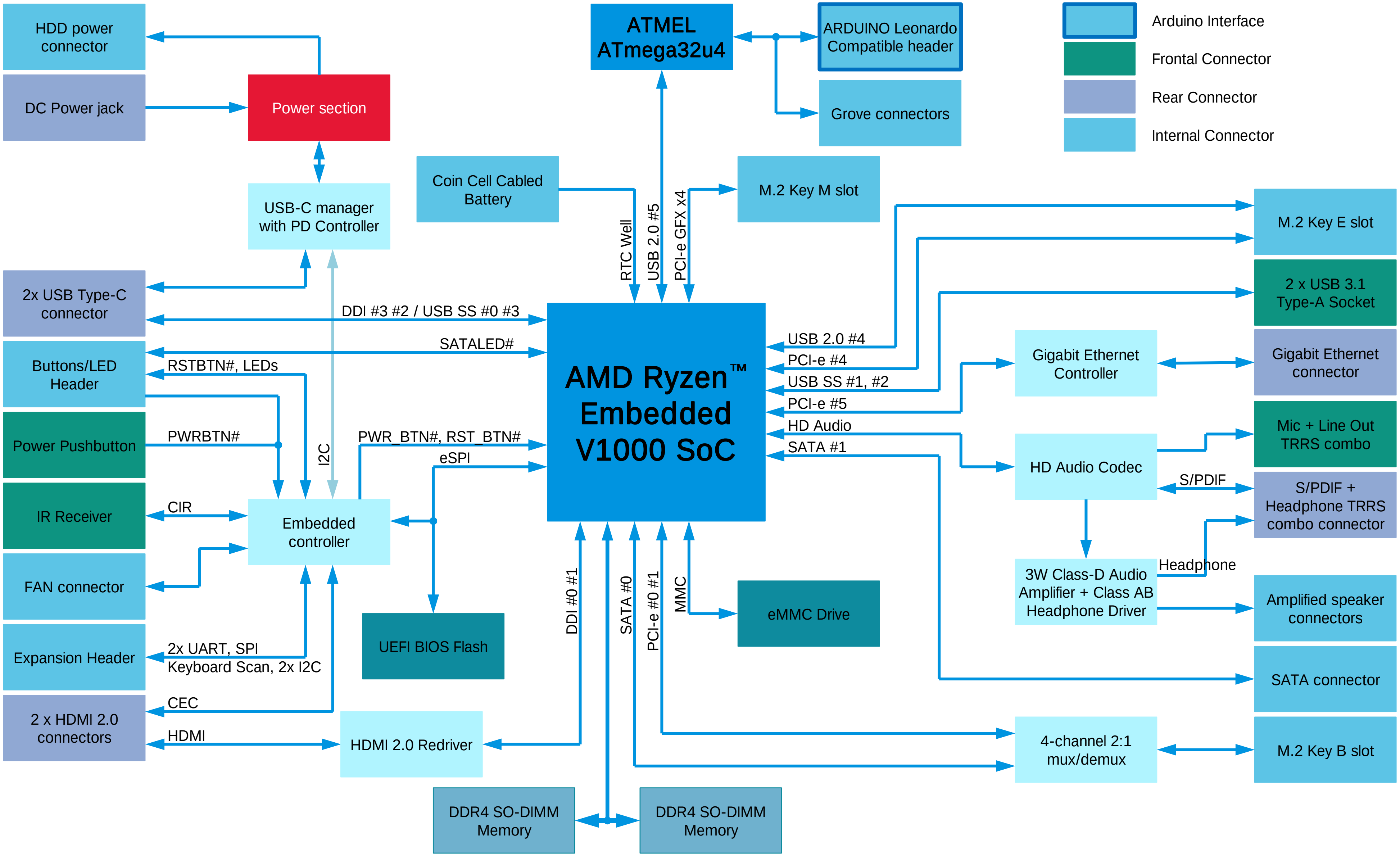
2.4 Mechanical specifications

The board dimensions are 120 x 120 mm (4.72” x 4.72”).

The printed circuit of the board is made of twelve layers, some of them are ground planes, for disturbance rejection.



2.5 Block diagram

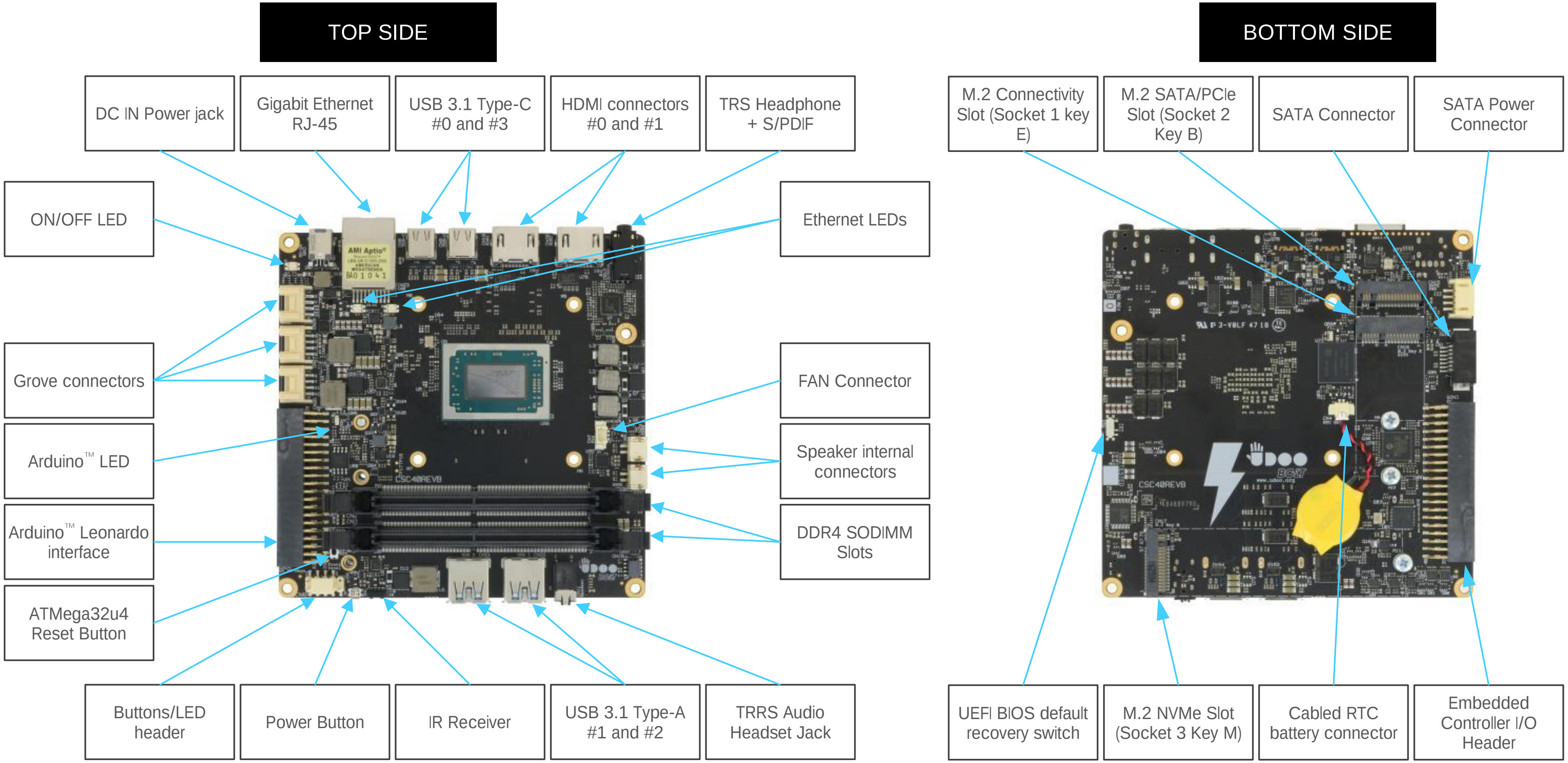


Chapter 3.
CONNECTORS

- Introduction
- Connectors overview
- Connectors description

3.1 Introduction

On UDOO BOLT board, there are several connectors located on the upper plane. Standard connectors are placed on the same sides of PCB, so that it is possible to place them on a panel of an eventual enclosure.



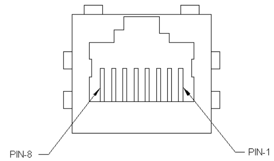
3.2 Connectors overview

Name	Description	Name	Description
CN4	Cabled RTC Battery	CN19	HDMI connector #1
CN5	DC IN Power Jack	CN20	HDMI connector #0
CN6	Buttons/LED Internal Header	CN21	USB 3.1 Type-A Port #1
CN7	FAN Connector	CN22	USB 3.1 Type-A Port #2
CN8	USB Type-C Port #0	CN23	Gigabit Ethernet connector
CN9	USB Type-C Port #3	CN24	Arduino™ Leonardo interface Connector
CN10	USB C Controller programming header (reserved)	CN25	Embedded Controller I/O Header
CN11	TRRS Audio Headset Jack	CN26	GROVE Analog Connector
CN12	TRS Headphone + S/PDIF	CN27	GROVE Digital / UART Connector
CN14	SATA Port #1 M 7p connector	CN28	GROVE I2C Connector
CN15	SATA Power Connector	CN29	Right Speaker Connector
CN16	M.2 Connectivity Slot (Socket 1 Key E Type 2230)	CN30	Left Speaker Connector
CN17	M.2 NVMe Slot (Socket 3 Key M Type 2280)	SW1	UEFI BIOS default Restore switch
CN18	M.2 SATA/PCI-e Slot (Socket 2 Key B type 2242 or 2260)	U61	IR Receiver

3.3 Connectors description

3.3.1 Ethernet connector

Gigabit Ethernet Connector- CN23			
Pin	**Signal**	**Pin**	**Signal**
1	GBE_MDI0+	5	GBE_MDI2-
2	GBE_MDI0-	6	GBE_MDI1-
3	GBE_MDI1+	7	GBE_MDI3+
4	GBE_MDI2+	8	GBE_MDI3-



On board, there is a Gigabit Ethernet connector, for the direct connection of the UDOO BOLT module to a wired LAN.

The Ethernet connection is managed by a dedicated Realtek RTL8111G Gigabit Ethernet controller, interfaced to PCI-express port #5.

This interface is compatible both with Gigabit Ethernet (1000Mbps) and with Fast Ethernet (10/100Mbps) Networks. They will configure automatically to work with the existing network.

Please be aware that it will work in Gigabit mode only in case that it is connected to Gigabit Ethernet switches/hubs/routers. For the connection, cables category Cat5e or better are required. Cables category Cat6 are recommended for noise reduction and EMC compatibility issues, especially when the length of the cable is significant.

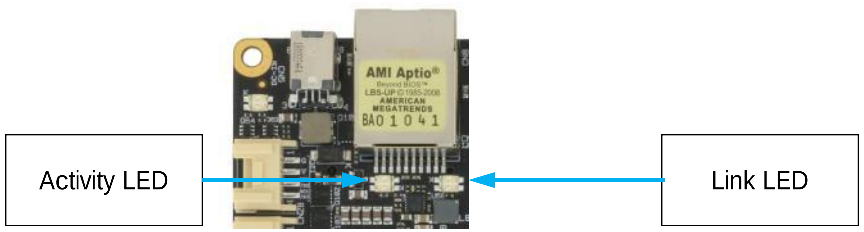
GBE_MDI0+/GBE_MDI0-: Ethernet Controller Media Dependent Interface (MDI) I/O differential pair #0. It is the first differential pair in Gigabit Ethernet mode, and the Transmit differential pair in 10/100 Mbps modes.

GBE_MDI1+/GBE_MDI1-: Ethernet Controller Media Dependent Interface (MDI) I/O differential pair #1. It is the second differential pair in Gigabit Ethernet mode, and the Receive differential pair in 10/100 Mbps modes.

GBE_MDI2+/GBE_MDI2-: Ethernet Controller Media Dependent Interface (MDI) I/O differential pair #2. It is the third differential pair in Gigabit Ethernet mode; it is not used in 10/100Mbps modes.

GBE_MDI3+/GBE_MDI3-: Ethernet Controller Media Dependent Interface (MDI) I/O differential pair #3. It is the fourth differential pair in Gigabit Ethernet mode; it is not used in 10/100Mbps modes.

Placed behind the GbE connector there are also two bicolour Green/Yellow LEDs: LED D159 (Right LED) shows 10/100 or 1000 connection: green means 100Mbps connection, yellow means 1000Mpbs connection, when the LED is Off then 10Mpbs or no connection is available. LED D160 (Left LED) shows ACTIVITY presence.



3.3.2 USB ports

The AMD Ryzen™ Embedded V1000 family of Processors used on UDOO BOLT board can manage up to five USB SuperSpeed (i.e., USB 3.1 compliant) ports and six High Speed (i.e. USB 2.0 compliant) ports. There is only one dedicated High Speed port, the other five ports are shared with the SuperSpeed ports, i.e. they can be used either by USB 2.0 or USB 3.0.

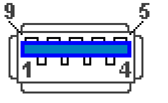
The USB 3.1 ports #1 and #2 are available on two single USB connectors, CN21 and CN22, placed on the same side of the PCB ("Frontal"), while USB 3.1 ports #0 and #3 are available on USB connectors CN8 and CN9 placed on the opposite side ("Rear"). "Rear" and "Frontal" terms are used considering a possible application of this board with an enclosure). The connectors used are standard USB 3.0 type-A receptacles.

USB 3.1 ports' connectors are standard type-A receptacle, they can be connected to all types of USB 1.1 / USB 2.0 / USB 3.0 devices using standard-A USB 3.x or USB 2.0 plugs.

For USB 3.x connections it is mandatory the use of SuperSpeed certified cables, whose SuperSpeed differential pairs are individually shielded inside the global cable's external shielding.

USB 3.1 port#1 type A receptacle – CN21			
Pin	**Signal**	**Pin**	**Signal**
1	$+5V_{USB1}$	5	USB_SSRX1-
2	USB_P1-	6	USB_SSRX1+
3	USB_P1+	7	GND
4	GND	8	USB_SSTX1-
		9	USB_SSTX1+

USB 3.1 port #2 type-A receptacle – CN22			
Pin	**Signal**	**Pin**	**Signal**
1	$+5V_{USB2}$	5	USB_SSRX2-
2	USB_P2-	6	USB_SSRX2+
3	USB_P2+	7	GND
4	GND	8	USB_SSTX2-
		9	USB_SSTX2+



Signal description:

USB_P1+/USB_P1-: USB 2.0 Port #1 differential pair.

USB_SSRX1+/USB_SSRX1-: USB Super Speed Port #1 receive differential pair.

USB_SSTX1+/USB_SSTX1-: USB Super Speed Port #1 transmit differential pair.

USB_P2+/USB_P2-: USB 2.0 Port #2 differential pair.

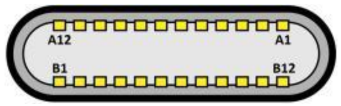
USB_SSRX1+/USB_SSRX1-: USB Super Speed Port #1 receive differential pair.

USB_SSTX1+/USB_SSTX1-: USB Super Speed Port #1 transmit differential pair.

Common mode chokes are placed on all USB differential pairs for EMI compliance.

For ESD protection, on all data and voltage lines are placed clamping diodes for voltage transient suppression.

USB ports #0 and #3, instead, are available on standard Type-C connectors (CN8 and CN9), with DisplayPort Alternate Mode and USB Dual Role Power Delivery (rel. 3.0) additional functionalities. This means that USB type-C connectors can be used to connect external USB devices, DP/HDMI displays or used to supply the board by using a 60W minimum USB-C Power Adapter (power profile 20V 3A).



USB 3.1 Port #0 is internally multiplexed by the AMD Ryzen™ Embedded V100 Processor with Display Port #3, USB 3.1 Port #3 is multiplexed with Display Port #2.

USB 3.1 port#0 type C receptacle – CN8			
Pin	**Signal**	**Pin**	**Signal**
A1	GND	B12	GND
A2	USBC0_SSTXA+	B11	USBC0_SSRXA+
A3	USBC0_SSTXA	B10	USBC0_SSRXA-
A4	VBUS_C0	B9	VBUS_C0
A5	USBC0_CC1	B8	USBC0_SBU2
A6	USB0_A+	B7	USB0_B-
A7	USB0_A-	B6	USB0_B+
A8	USBC0_SBU1	B5	USBC0_CC2
A9	VBUS_C0	B4	VBUS_C0
A10	USBC0_SSRXB-	B3	USBC0_SSTXB-
A11	USBC0_SSRXB+	B2	USBC0_SSTXB+
A12	GND	B1	GND

USB 3.1 port #3 type-C receptacle – CN9			
Pin	**Signal**	**Pin**	**Signal**
A1	GND	B12	GND
A2	USBC3_SSTXA+	B11	USBC3_SSRXA+
A3	USBC3_SSTXA-	B10	USBC3_SSRXA-
A4	VBUS_C3	B9	VBUS _C3
A5	USBC3_CC1	B8	USBC3_SBU2
A6	USB3_A+	B7	USB3_B-
A7	USB3_A-	B6	USB3_B+
A8	USBC3_SBU1	B5	USBC3_CC2
A9	VBUS_C3	B4	VBUS_C3
A10	USBC3_SSRXB-	B3	USBC3_SSTXB-
A11	USBC3_SSRXB+	B2	USBC3_SSTXB+
A12	GND	B1	GND

Signal description:

USB0_A+/USB0_A-: USB 2.0 Port #0 differential pair, position 1.

USB0_B+/USB0_B-: USB 2.0 Port #0 differential pair, position 2.

USBC0_SSRXA+/USBC0_SSRXA-: USB Super Speed Port #0 receive first differential pair. When used for DP Alternate mode, this pair carries out Display Port #3 Differential pair #3.

USBC0_SSTXA+/USBC0_SSTXA-: USB Super Speed Port #1 transmit first differential pair. When used for DP Alternate mode, this pair carries out Display Port #3 Differential pair #2.

USBC0_SSRXB+/USBC0_SSRXB-: USB Super Speed Port #0 receive second differential pair. When used for DP Alternate mode, this pair carries out Display Port #3 Differential pair #0.

USBC0_SSTXB+/USBC0_SSTXB-: USB Super Speed Port #1 transmit second differential pair. When used for DP Alternate mode, this pair carries out Display Port #3 Differential pair #1.

USBC0_CC1: USB-C Port #0 Configuration Channel #1

USBC0_CC2: USB-C Port #0 Configuration Channel #2

USBC0_SBU1: USB-C Port #0 Sideband Use signal #1 When used for DP Alternate mode, this pair carries out Display Port #3 Aux Signal positive line.

USBC0_SBU2: USB-C Port #0 Sideband Use signal #2. When used for DP Alternate mode, this pair carries out Display Port #3 Aux Signal negative line

VBUS_C0: USB-C Port #0 VBUS power rail. Can be used both for powering client devices with a 5V voltage (power source mode) or to power the whole board using an USB-C power adapter (power sink mode).

USB3_A+/USB3_A-: USB 2.0 Port #3 differential pair, position 1.

USB3_B+/USB3_B-: USB 2.0 Port #3 differential pair, position 2.

USBC3_SSRXA+/USBC3_SSRXA-: USB Super Speed Port #3 receive first differential pair. When used for DP Alternate mode, this pair carries out Display Port #2 Differential pair #3.

USBC3_SSTXA+/USBC3_SSTXA-: USB Super Speed Port #3 transmit first differential pair. When used for DP Alternate mode, this pair carries out Display Port #2 Differential pair #2.

USBC3_SSRXB+/USBC3_SSRXB-: USB Super Speed Port #3 receive second differential pair. When used for DP Alternate mode, this pair carries out Display Port #2 Differential pair #0.

USBC3_SSTXB+/USBC3_SSTXB-: USB Super Speed Port #3 transmit second differential pair. When used for DP Alternate mode, this pair carries out Display Port #2 Differential pair #1.

USBC3_CC1: USB-C Port #3 Configuration Channel #1

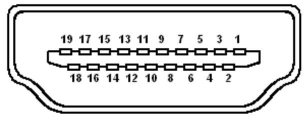
USBC3_CC2: USB-C Port #3 Configuration Channel #2

USBC3_SBU1: USB-C Port #3 Sideband Use signal #1 When used for DP Alternate mode, this pair carries out Display Port #2 Aux Signal positive line.

USBC3_SBU2: USB-C Port #3 Sideband Use signal #2. When used for DP Alternate mode, this pair carries out Display Port #2 Aux Signal negative line

VBUS_C3: USB-C Port #3 VBUS power rail. Can be used both for powering client devices with a 5V voltage (power source mode) or to power the whole board using an USB-C power adapter (power sink mode).

3.3.3 HDMI connectors



The AMD Ryzen™ Embedded V1000 family of Processors offer four Digital Display Interfaces, configurable to work in HDMI/DVI/DP++ modes.

On the UDOO BOLT board, the Digital Display Interfaces #0 and #1 are used to implement two HDMI 2.0 interfaces through as many HDMI 2.0 ReDriver / Level shifters and ESD protection + signal conditioning ICs.

Therefore, on-board there are two standard certified HDMI connector, right-angle, type A, MOLEX P/N 47151-1001.

HDMI Connector #1– CN19			
Pin	**Signal**	**Pin**	**Signal**
1	HDMI1_LANE2+	2	GND
3	HDMI1_LANE2-	4	HDMI1_LANE1+
5	GND	6	HDMI1_LANE1-
7	HDMI1_LANE0+	8	GND
9	HDMI1_LANE0-	10	HDMI1_CLK+
11	GND	12	HDMI1_CLK-
13	HDMI1_CEC	14	HDMI1_UTILITY
15	HDMI1_SCL	16	HDMI1_SDA
17	GND	18	$+5V_{HDMI1}$
19	HDMI1_HPD		

HDMI Connector #0 – CN20			
Pin	**Signal**	**Pin**	**Signal**
1	HDMI0_LANE2+	2	GND
3	HDMI0_LANE2-	4	HDMI0_LANE1+
5	GND	6	HDMI0_LANE1-
7	HDMI0_LANE0+	8	GND
9	HDMI0_LANE0-	10	HDMI0_CLK+
11	GND	12	HDMI0_CLK-
13	HDMI0_CEC	14	HDMI0_UTILITY
15	HDMI0_SCL	16	HDMI0_SDA
17	GND	18	$+5V_{HDMI0}$
19	HDMI0_HPD		

Signals involved in HDMI management are the following:

HDMI0_CLK+/ HDMI0_CLK-: HDMI port #0 differential Clock.

HDMI0_LANE0+/ HDMI0_LANE0-: HDMI port #0 differential pair #0

HDMI0_LANE1+/ HDMI0_LANE1-: HDMI port #0 differential pair #1

HDMI0_LANE2+/HDMI0_LANE2-: HDMI port #0 differential pair #2

HDMI0_SDA: DDC Data line for HDMI port #0. Bidirectional signal, electrical level $+5V_{HDMI0}$ with a 1k87Ω pull-up resistor.

HDMI0_SCL: DDC Clock line for HDMI port #0. Output signal, electrical level $+5V_{HDMI0}$ with a 1k87Ω pull-up resistor.

HDMI0_CEC: HDMI Consumer Electronics Control (CEC) Line. Bidirectional signal, electrical level +3.3V_DSW with a 27kΩ pull-up resistor and Schottky Diode.

HDMI0_HPD: HDMI Port #0 Hot Plug Detect Input signal. $+5V_{HDMI0}$ electrical level signal with dynamic pull-down.

HDMI0_UTILITY: HDMI Port #0 Utility Input signal. $+5V_{HDMI0}$ electrical level signal.

HDMI1_CLK+/ HDMI1_CLK-: HDMI port #1 differential Clock.

HDMI1_LANE0+/ HDMI1_LANE0-: HDMI port #1differential pair #0

HDMI1_LANE1+/ HDMI1_LANE1-: HDMI port #1differential pair #1

HDMI1_LANE2+/HDMI1_LANE2-: HDMI port #1differential pair #2

HDMI1_SDA: DDC Data line for HDMI port #1. Bidirectional signal, electrical level $+5V_{HDMI1}$ with a 1k87Ω pull-up resistor.

HDMI1_SCL: DDC Clock line for HDMI port #1. Output signal, electrical level $+5V_{HDMI1}$ with a 1k87Ω pull-up resistor.

HDMI1_CEC: HDMI Consumer Electronics Control (CEC) Line. Bidirectional signal, electrical level +3.3V_DSW with a 27kΩ pull-up resistor and Schottky Diode.

HDMI1_HPD: HDMI Port #1 Hot Plug Detect Input signal. $+5V_{HDMI1}$ electrical level signal with dynamic pull-down.

HDMI1_UTILITY: HDMI Port #1 Utility Input signal. $+5V_{HDMI1}$ electrical level signal.

All data and voltage lines are protected against ESD.

Always use HDMI-certified cables for the connection between the board and the HDMI display; a category 2 (High-Speed) cable is recommended for higher resolutions, category 1 cables can be used for 720p resolution.

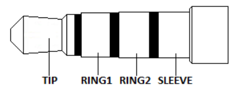
3.3.4 Audio interfaces

In the UDOO BOLT board, audio functionalities are provided by a Realtek ALC888S High Definition Audio Codec.

TRRS Audio headset jack- CN11	
Pin	**Signal**
TIP	Headphone Out Left Channel
RING1	Headphone Out Right Channel
RING2	MIC-/MIC+
SLEEVE	MIC+/MIC-

In order to reduce the space dedicated to connectors, there is a TRRS Combo Audio Socket, i.e. a single socket which offer both stereo Line Out and Mic In functionalities.

Such TRRS Combo Audio socket can be used with any 4-poles 3.5mm diameter audio jack, with pinout compatible with the most recent Headsets, shown in the table on the left.



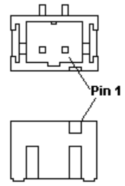
Right Speaker Connector- CN29	
Pin	**Signal**
1	Speaker Right Channel +
2	Speaker Right Channel -

Left Speaker Connector- CN30	
1	Speaker Left Channel -
2	Speaker Left Channel +

Additionally, it is also possible to connect external stereo speakers by using the dedicated connectors CN29 and CN30, which are two connectors type HR p/n A2001WV-S-02PD01 or equivalent.

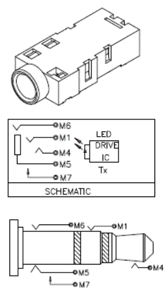
Mating connector: HR p/n A2001H-02P with A2001 series female crimp terminals.

The speaker output available on connectors CN29 and CN30 is Class-D amplified, 3W global power on 4Ohm Load / 1.7W global power on 8Ohm load (recommended).



TRS Headphone + S/PDIF - CN12	
Pin	**Signal**
TIP	Headphone Out Left Channel
RING	Headphone Out Right Channel
SLEEVE	GND

Furthermore, on the Rear panel Side, there is a combo analogic / digital connector, a TRS 3.5mm audio socket which integrates also a LED Transmitter for S/PDIF optical connections (Optical 3.5mm jack). This connector can therefore be used to connect both analog headsets (TRS plug) and digital audio devices (coaxial optical cable with 3.5mm jack, like in the picture).

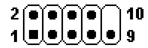


3.3.5 Buttons / LED header

Buttons / LED Header – CN6			
Pin	**Signal**	**Pin**	**Signal**
1	HD_LED_P	2	FP PWR_P/SLP_N
3	HD_LED_N	4	FP PWR_N/SLP_P
5	RST_SW_N	6	PWR_SW_P
7	RST_SW_P	8	PWR_SW_N
9	---		

To allow the integration of a UDOO BOLT based system inside a box PC-like, there is a connector on the board that allows to remote signals for the Power Button (to be used to put the system in a Soft Off State, or awake from it), for the Reset Button, and the signal for optional LED signalling activity on SATA Channel and Power On states.

The pinout of this connector complies with Intel® Front Panel I/O connectivity Design Guide, Switch/LED Front Panel section, chapter 2.2. It is shown in the table on the left.



Connector CN6 is an internal 9-pin standard male pin header, p 2.54 mm, 5+4 pin, h= 6mm, type NELTRON p/n 2213S-10G-E10 or equivalent.

Signals Description

HD_LED_P: Hard Disk Activity LED signal's pull-up to +5V_RUN voltage (510Ω pull-up).

HD_LED_N: Hard Disk Activity LED output signal

RST_SW_N: Reset Button GND

RST_SW_P: Reset button input signal. This signal has to be connected to an external momentary pushbutton (contacts normally open). When the pushbutton is pressed, the pulse of Reset signal will cause the reset of the board. +3.3V_DSW electrical level with 4k7Ω pull-up.

PWR_SW_P: Power button input signal, +3.3V_DSW electrical level with 4k7Ω pull-up. This signal can be connected to an external momentary pushbutton (contacts normally open). Upon the pressure of this pushbutton, the pulse of this signal will let the switched voltage rails turn on or off. Please be aware that this signal is also driven by the momentary pushbutton located on-board, near the header itself (please refer to the picture at page 24).

PWR_SW_N: Power button GND

FP PWR_P/SLP_N: Power/Sleep messaging LED terminal 1 with 510Ω pull-up resistor to +5V_ALW voltage. Connect it to an extremity of a dual-color power LED for power ON/OFF, sleep and message waiting signalling. Please refer to Intel® Front Panel I/O connectivity Design Guide, chapter 2.2.4, for LED functionalities and signal meaning.

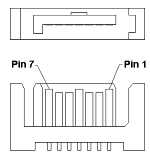
FP PWR_N/SLP_P: Power/Sleep messaging LED terminal 2 with 510Ω pull-up resistor to +5V_ALW voltage. Connect it to the other extremity of the dual-color power LED above mentioned.

3.3.6 SATA connectors

SATA Connector - CN14	
Pin	**Signal**
1	GND
2	SATA1_Tx+
3	SATA1_Tx-
4	GND
5	SATA1_Rx-
6	SATA1_Rx+
7	GND

The AMD Ryzen™ Embedded V1000 family of Processors embed a SATA Controller, which offers two SATA III, 6.0 Gbps interfaces.

Of these interfaces, one SATA channel is carried out to a standard male S-ATA connector, CN14 (the other SATA channel is available on the M.2 Key B socket, CN18, please check par. 3.3.7).



Here following the signals related to SATA interface:

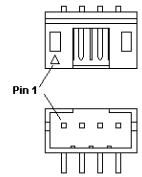
SATA1_TX+/SATA1_TX-: Serial ATA Channel #1 Transmit differential pair

SATA1_RX+/SATA1_RX-: Serial ATA Channel #1 Receive differential pair

10nF AC series decoupling capacitors are placed on each line of SATA differential pairs.

S-ATA Power Connector – CN15	
Pin	**Signal**
1	---
2	GND
3	GND
4	+5V_RUN

A dedicated power connector, CN15, can be used to give supply to external Hard Drives (or Solid State Drives) connected to the SATA male connector.



The dedicated power connector is a 4-pin male connector, type JST p/n S4B-PH-SM4-TB or equivalent, with pinout shown in the table on the left.

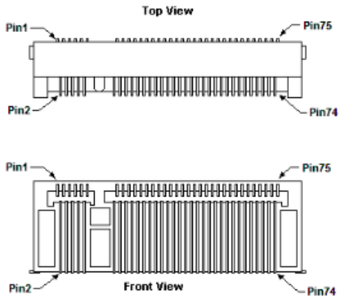
Mating connector: JST PHR-4 crimp housing with JST SPH-002T-P0.5L crimp terminals.

Maximum allowed power consumption for this connector is 1A.

3.3.7 M.2 SATA/PCI-e Slot: Socket 2 Key B type 2242/2260

M.2 SATA/PCI-e Slot – CN18			
Pin	**Signal**	**Pin**	**Signal**
1	---	2	+3.3V_RUN
3	GND	4	+3.3V_RUN
5	GND	6	---
7	---	8	---
9	---	10	---
11	GND		
		20	---
21	---	22	---
23	---	24	---
25	---	26	---
27	GND	28	---
29	PCIe1_Rx-	30	---
31	PCIe1_Rx+	32	---
33	GND	34	---
35	PCIe1_Tx-	36	---
37	PCIe1_Tx+	38	---
39	GND	40	---
41	SATA0_Rx+/PCIe0_Rx-	42	---
43	SATA0_Rx-/PCIe0_Rx+	44	---
45	GND	46	---
47	SATA0_Tx-/PCIe0_Tx-	48	---
49	SATA0_Tx+/PCIe0_Tx+	50	PLT_RST#
51	GND	52	PCIE_REQ0#
53	PCIe0_Clock-	54	---
55	PCIe0_Clock+	56	---
57	GND	58	---

The mass storage capabilities of the UDOO BOLT are completed by an M.2 SSD Slot, which allow plugging M.2 Socket 2 Key B Solid State Drives with SATA interface or PCI-e x2 interface (PCI-e x1 is also supported).



The connector used for the M.2 SATA/PCI-e slot is CN18, which is a standard 75 pin M.2 Key B connector, type LOTES p/n APCI0087-P001A, H=8.5mm, with the pinout shown in the table on the left.

On the UDOO BOLT board there is also a Threaded Spacer which allows the placement of M.2 Socket 2 Key B SATA/PCI-e modules in 2260 size.

It is possible to place also modules in 2242 or 2260 size, by using a M/F Spacer which allows fixing the M.2 module on the spacer already available on the PCB, deemed for the fixing of the M.2 connectivity slot (see next paragraph)

Here following the signals related to the SATA interface:

SATA0_Tx+/SATA0_Tx-: Serial ATA Channel #0 Transmit differential pair

SATA0_Rx+/SATA0_Rx-: Serial ATA Channel #0 Receive differential pair

10nF AC series decoupling capacitors are placed on each line of SATA differential pairs.

Here following the signals related to the PCI-e interface:

PCIe0_TX+/PCIe0_TX-: PCI Express lane #0, Transmitting Output Differential pair

PCIe0_RX+/PCIe0_RX-: PCI Express lane #0, Receiving Input Differential pair

PCIe1_TX+/PCIe1_TX-: PCI Express lane #1, Transmitting Output Differential pair

PCIe1_RX+/PCIe1_RX-: PCI Express lane #1, Receiving Input Differential pair

PCIe0_Clock+ / PCIe0_Clock-: PCI Express Reference Clock for lane #2, Differential Pair

PLT_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board (i.e. the GbE controller, the PCI-e based SSD modules plugged in the CN18 slot, the PCI-e x4 NVMe modules plugged in CN17slot and the connectivity modules plugged in CN16 slot). It is a 3.3V_RUN active-low signal.

59	---	60	---
61	---	62	---
63	---	64	---
65	---	66	---
67	---	68	---
69	CONFIG_1	70	+3.3V_RUN
71	GND	72	+3.3V_RUN
73	GND	74	+3.3V_RUN
75	---		

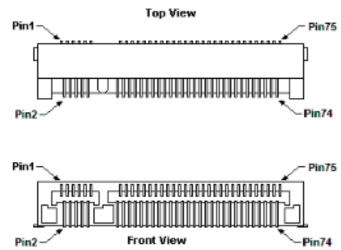
PCIe_REQ0#: PCI Express Clock Request Input, active low signal. This signal shall be driven low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

CONFIG_1: Configuration input signal, +3.3V_RUN signal with 10kΩ pull-up. This signal is necessary to switch between the S-ATA and the PCI-e signals on the pins 41/43/47/49 of connector CN18. When CONFIG_1 signal is high, then PCI-e x 2 interface is available on connector CN18. When the signal is driven low, then SATA interface will be available. The selection is automatic, since according to M.2 specifications for Socket2 SSD modules, CONFIG_1 signal must be low for SSD based modules and high for PCI-e based modules.

The PCI-e x2 interface can be used also for different purposes other than SSD modules, but it is important that the CONFIG_1 signal is driven properly (it can be left unconnected on PCI-e based modules, due to the presence of the pull-up resistor on the platform).

3.3.8 M.2 Connectivity Slot: Socket 1 Key E Type 2230

M.2 Connectivity Slot - CN16			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	+3.3V_ALW
3	USB_P4+	4	+3.3V_ALW
5	USB_P4-	6	---
7	GND	8	---
9	---	10	---
11	---	12	---
13	---	14	---
15	---	16	---
17	---	18	GND
19	---	20	---
21	---	22	---
23	---		
		32	---
33	GND	34	---
35	PCIe4_Tx+	36	---



It is possible to increase the connectivity of the UDOO BOLT board by using M.2 Socket 1 Key E connectivity modules (i.e. modules with functionalities like WiFi + Bluetooth).

The connector used for the M.2 Connectivity slot is CN16, which is a standard 75 pin M.2 Key E connector, type LOTES p/n APCI0076-P001A, H=4.2mm, with the pinout shown in the table on the left.

On the UDOO BOLT board there is also a Threaded Spacer which allows the placement of M.2 Socket 1 Key E connectivity modules in 2230 size.

Here following the signals related to this connectivity interface:

USB_P4+/USB_P4-: USB 2.0 Port #4 differential pair.

PCIe4_TX+/PCIe4_TX-: PCI Express lane #4, Transmitting Output Differential pair

PCIe4_RX+/PCIe4_RX-: PCI Express lane #4, Receiving Input Differential pair

PCIe4_Clock+ / PCIe4_Clock-: PCI Express Reference Clock for lane #4, Differential Pair

M.2_WAKE#: Board's Wake Input, 3.3V_A active low signal. It must be externally driven by the Connectivity module plugged in the slot when it requires waking up the system.

PLT_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board

37	PCIe4_Tx-	38	---
39	GND	40	---
41	PCIe4_Rx+	42	---
43	PCIe4_Rx-	44	---
45	GND	46	---
47	PCIe4_CLK+	48	---
49	PCIe4_CLK-	50	SUS_CLK
51	GND	52	PLT_RST#
53	PCIe_REQ4#	54	BT_DISABLE#
55	M.2_WAKE#	56	WIFI_DISABLE
57	GND	58	---
59	---	60	---
61	---	62	---
63	GND	64	---
65	---	66	---
67	---	68	---
69	GND	70	---
71	---	72	+3.3V_ALW
73	---	74	+3.3V_ALW
75	GND		

(i.e. the GbE controller, the PCI-e based SSD modules plugged in the CN16 slot, the connectivity modules plugged in CN18 slot, the PCI-e x4 NVMe modules plugged in CN17slot). It is a 3.3V_RUN active-low signal.

PCIe_REQ4#: PCI Express Clock Request Input, active low signal. This signal shall be driven low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

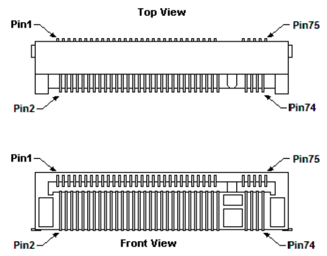
SUS_CLK: 32.768kHz Clock provided by the UDOO BOLT board to the module plugged in the slot CN16. +3.3V_ALW electrical level.

BT_DISABLE#: Bluetooth module disable, active low signal, +3.3V_ALW electrical level. This signal can be used to disable Bluetooth functionalities of any connectivity module plugged in CN16 Slot.

WIFI_DISABLE#; WiFi module disable, active low signal, +3.3V_ALW electrical level. This signal can be used to disable WiFi functionalities of any connectivity module plugged in CN16 Slot.

3.3.9 M.2 NVMe Slot: Socket 3 Key M Type 2280

M.2 NVMe Slot - CN17			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	+3.3V_RUN
3	GND	4	+3.3V_RUN
5	GFX_Rx3-	6	---
7	GFX_Rx3+	8	---
9	GND	10	---
11	GFX_Tx3-	12	+3.3V_RUN
13	GFX_Tx3+	14	+3.3V_RUN
15	GND	16	+3.3V_RUN
17	GFX_Rx2-	18	+3.3V_RUN
19	GFX_Rx2+	20	---
21	GND	22	---
23	GFX_Tx2-	24	---
25	GFX_Tx2+	26	---
27	GND	28	---
29	GFX_Rx1-	30	---
31	GFX_Rx1+	32	---
33	GND	34	---
35	GFX_Tx1-	36	---
37	GFX_Tx1+	38	---
39	GND	40	---
41	GFX_Rx0-	42	---
43	GFX_Rx0+	44	---
45	GND	46	---
47	GFX_Tx0-	48	---
49	GFX_Tx0+	50	PLT_RST#
51	GND	52	GFX_REQ#



Another possibility for connecting mass storage devices is given by the M.2 Key M Slot, which allows the plugging of M.2 High Capacity SSD drives with PCI-e x4 interface.

The connector used for the M.2 SSD slot is CN17, which is a standard 75 pin M.2 Key M connector, type LOTES p/n APCI0096-P005H, H=8.5mm, with the pinout shown in the table on the left.

On the UDOO BOLT board there is also a Threaded Spacer which allows the placement of M.2 Socket 3 Key M PCI-e SSD modules in 2280 size.

Here following the signals related to this connectivity interface:

GFX_Tx0+/GFX_Tx0-: PCI-e GFX port x4 lane #0, Transmitting Output Differential pair

GFX_Rx0+/GFX_Rx0-: PCI-e GFX port x4 lane #0, Receiving Input Differential pair

GFX_Tx1+/GFX_Tx1-: PCI-e GFX port x4 lane #1, Transmitting Output Differential pair

GFX_Rx1+/GFX_Rx1-: PCI-e GFX port x4 lane #1, Receiving Input Differential pair

GFX_Tx2+/GFX_Tx2-: PCI-e GFX port x4 lane #2, Transmitting Output Differential pair

GFX_Rx2+/GFX_Rx2-: PCI-e GFX port x4 lane #2, Receiving Input Differential pair

GFX_Tx3+/GFX_Tx3-: PCI-e GFX port x4 lane #3, Transmitting Output Differential pair

GFX_Rx3+/GFX_Rx3-: PCI-e GFX port x4 lane #3, Receiving Input Differential pair

PCIe4_Clock+ / PCIe4_Clock-: PCI Express Reference Clock for lane #4, Differential Pair

PLT_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board (i.e. the GbE controller, the PCI-e based SSD modules plugged in the CN16 slot, the connectivity modules plugged in CN18 slot, the PCI-e x4 NVMe modules plugged in CN17slot). It is a 3.3V_RUN active-low signal.

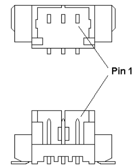
GFX_REQ#: PCI Express GFX Clock Request Input, active low signal. This signal shall be driven low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

53	PEG_CLK-	54	---
55	PEG_CLK+	56	---
57	GND	58	---
67	---	68	---
69	---	70	+3.3V_RUN
71	GND	72	+3.3V_RUN
73	GND	74	+3.3V_RUN
75	GND		

3.3.10 FAN connector

FAN Connector – CN7	
Pin	**Signal**
1	GND
2	FAN_POWER
3	FAN_TACHO_IN

Depending on the usage model of UDOO BOLT, for critical applications/environments on UDOO BOLT it is available a 3-pin single line SMT connector for an external +5V_{DC} FAN.



The Connector is a type MOLEX 53398-0571 or equivalent, with pinout shown in the table on the left.

Mating connector: MOLEX 51021-0300 receptacle with MOLEX 50079-8000 female crimp terminals.

Please be aware that the use of an external fan depends strongly on customer's application/installation.

FAN_POWER: +5V_ALW derived power rail for FAN.

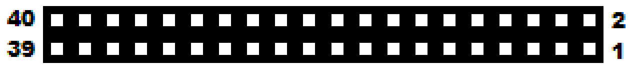
FAN_TACHO_IN: tachometric input from the FAN to the embedded microcontroller, +3.3V_RUN electrical level signal with 10kΩ pull-up resistor.

3.3.11 ARDUINO™ interface

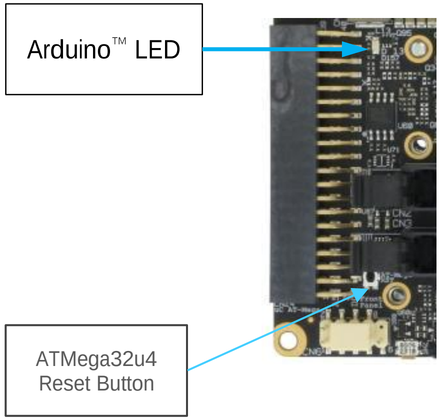
Pin	Signal	Pin	Signal
Arduino™ Interface Connector – CN24			
1	A5	2	D0 / RX
3	A4	4	D1 / TX
5	A3	6	D2 / SDA
7	A2	8	D3 / SCL
9	A1	10	D4
11	A0	12	D5*
13	---	14	D6*
15	GND	16	D7
17	GND	18	IO8
19	5V_OUT	20	IO9*
21	3.3V_OUT	22	IO10*
23	RESET#	24	IO11*
25	5V_OUT	26	IO12
27	MISO	28	IO13*
29	MOSI	30	GND
31	SCK	32	AREF
33	GND	34	D2/SDA
35	RXLED	36	D3/SCL
37	TXLED	38	GND
39	5V_OUT	40	5V_OUT

On a dual row p.2.54mm dedicated female header is realised an Arduino™ Leonardo interface, which is managed by an ATMEL ATmega32U4 microcontroller, connected to the AMD Ryzen™ Embedded V1000 processor via an internal USB. It's exactly the same thing as having an Arduino™ Leonardo board attached via USB to a standard PC.

It is possible to refer to Arduino™ Leonardo documentation for a description of the signals available on this connector, and the way to use them.



Near the connector, there is also an integrated Yellow SMT LED, which indicates the proper working of Arduino™ section. This LED is driven by using IO13* signal, it's working depends on the programming of ATmega32u4 microcontroller.



On-board, between the Arduino™ interface connector CN24 and the buttons/led header CN6, it is also available a miniaturized momentary switch, that can be used to reset the ATmega32u4 microcontroller.

3.3.12 GROVE connectors

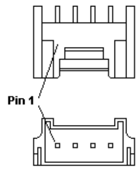
The UDOO Bolt board offers the possibility of managing Seeed Technology Grove family of sensors through the Arduino™ platform by using three dedicated connectors, directly managed by the ATmega ATmega32u4 controller.

GROVE Analog connector – CN26		
Pin	**Signal**	**GROVE standard ref.**
1	GND	4
2	5V_OUT	3
3	A1	2
4	A0	1

All three connectors are type TKP p/n P20Y1L-04SMT or equivalent, with the pinout shown in the tables on the left.

Mating connector: TKP receptacle p/n H20Y1-04 with TKP DHT-1S(LF) female crimp terminals.

The signals available on these three connectors are the same available on the Arduino™ interface connector CN24.



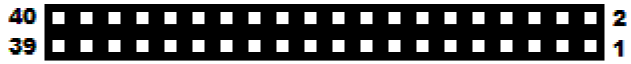
GROVE Digital / UART connector - CN27		
Pin	**Signal**	**GROVE standard ref.**
1	GND	4
2	5V_OUT	3
3	D1/TX	2
4	D0/RX	1

GROVE Digital / I2C connector – CN28		
Pin	**Signal**	**GROVE standard ref.**
1	GND	4
2	5V_OUT	3
3	D2 / SDA	2
4	D3 / SCL	1

Please notice that these connectors seems to be mirrored with respect to GROVE standard connectors. Actually, the pinout shown in these tables is referred to the real pin position #1 engraved on the connector. Cables designed for GROVE sensors will fit into these connectors without needing any change.

3.3.13 Embedded Controller I/O Header

On board's bottom sidem there is another dual row 40-pin p 2.54mm female header, which makes available other signals for possible external expansions, that are directly managed by the Embedded Controller.



More specifically, on this connector will be available an SPI interface, a FAN Control interface, two I2C interfaces, a Matrix scan interface and two UARTs, where some interfaces share the same pins. Most of these signals can also be used as GPIOs.

Embedded controller Feature header – CN25			
Pin	Signal	Pin	Signal
1	EC_SPI_MISO	2	EC_SPI_CS#
3	EC_SPI_MOSI	4	EC_SPI_CLK
5	EC_NRST	6	WAKE#
7	EC_TDO_I2C_SCL2	8	EC_TMS_I2C_SCL1
9	EC_TDI_I2C_SDA2	10	EC_TCK_I2C_SDA1
11	FANOUT0	12	FANTACH0
13	EC_KSO0	14	EC_KSI0
15	EC_KSO1	16	EC_KSI1
17	EC_KSO2	18	EC_KSI2
19	EC_KSO3	20	EC_KSI3
21	EC_KSO4	22	EC_KSI4
23	EC_KSO8_PVTIO0	24	EC_KSO11_PVTCS#
25	EC_KSO9_PVTIO1	26	EC_KSO12_PVTCLK
27	EC_KSO10_PVTIO2	28	EC_KSO13_PVTIO3
29	GND	30	+3.3V_OUT
31	GND	32	+3.3V_OUT
33	EC_UART_RxD1	34	EC_UART_RxD0
35	EC_UART_TxD1	36	EC_UART_TxD0
37	EC_UART_RTS#1	38	EC_UART_RTS#0
39	EC_UART_CTS#1	40	EC_UART_CTS#0

Please notice that JTAG interface and Private Flash Interface, described below, are disabled to the end-users, since they are reserved for manufacturing purposes.

Here following the description of the signals available on this connector:

EC_SPI_MOSI: EC's SPI #0 interface Master Out Slave In output Signal, electrical level +3.3V_DSW.

EC_SPI_MISO: EC's SPI #0 interface Master In Slave Out input Signal, electrical level +3.3V_DSW

EC_SPI_CS#: EC's SPI #0 interface Chip Select active low output signal, electrical level +3.3V_DSW

EC_SPI_CLK: EC's SPI #0 interface Clock output, electrical level +3.3V_DSW

EC_NRST: EC's JTAG interface Reset input signal, electrical level +3.3V_DSW with 10kΩ pull-down resistor

EC_TDO_I2C_SCL2: EC's JTAG interface Test Data Out output signal / I2C Port #9 Clock line. Output signal, electrical level +3.V_DSW with 2k2Ω pull-up resistor.

EC_TDI_I2C_SDA2: : EC's JTAG interface Test Data IN input signal / I2C Port #9 data line. Bidirectional signal, electrical level +3.3V_DSW with 2k2Ω pull-up resistor.

EC_TMS_I2C_SCL1: EC's JTAG interface Test Mode Select output signal / I2C Port #8 Clock line. Output signal, electrical level +3.V_DSW with 2k2Ω pull-up resistor

EC_TCK_I2C_SDA1: EC's JTAG interface Test Clock signal / I2C Port #8 data line. Bidirectional signal, electrical level +3.3V_DSW with 2k2Ω pull-up resistor.

WAKE# EC Wake# capable Input Signal, electrical level +3.3V_DSW with 2k2Ω pull-up resistor

FANOUT0: EC PWM #0 Output Signal, electrical level +3.3V_DSW.

FANTACH0: EC FAN Tachometric #0 Input signal, electrical level +3.3V_DSW.

EC_KSO0: EC Keyboard Matrix Scan Output #0, electrical level +3.3V_DSW

EC_KSO1: EC Keyboard Matrix Scan Output #1,electrical level +3.3V_DSW

EC_KSO2: EC Keyboard Matrix Scan Output #2,electrical level +3.3V_DSW

EC_KSO3: EC Keyboard Matrix Scan Output #3, electrical level +3.3V_DSW

EC_KSO4: EC Keyboard Matrix Scan Output #4,electrical level +3.3V_DSW

EC_KSI0: EC Matric Scan Input #0,electrical level +3.3V_DSW

EC_KSI1: EC Keyboard Matrix Scan Input #1,electrical level +3.3V_DSW

EC_KSI2: EC Keyboard Matrix Scan Input #2, electrical level +3.3V_DSW

EC_KSI3: EC Keyboard Matrix Scan Input #3, electrical level +3.3V_DSW

EC_KSI4: EC Keyboard Matrix Scan Input #4, electrical level +3.3V_DSW

EC_KSO8_PVTIO0: EC Keyboard Matrix Scan Output #8 / Private Flash port Data 0, bidirectional signal electrical level +3.3V_DSW

EC_KSO9_PVTIO1: EC Keyboard Matrix Scan Output #9 / Private Flash port Data 1, bidirectional signal electrical level +3.3V_DSW

EC_KSO10_PVTIO2: EC Keyboard Matrix Scan Output #10 / Private Flash port Data 2, bidirectional signal, electrical level +3.3V_DSW

EC_KSO11_PVTCS#: EC Keyboard Matrix Scan Output #11 / Private Flash port Chip Select, output signal, electrical level +3.3V_DSW

EC_KSO12_PVTCLK: EC Keyboard Matrix Scan Output #12 / Private Flash port Clock, output signal electrical level +3.3V_DSW

EC_KSO13_PVTIO3: EC Keyboard Matrix Scan Output #13 / Private Flash port Data 3, bidirectional signal electrical level +3.3V_DSW

EC_UART_RxD0: EC UART #0, Serial data Receive (input) line, +3.3V_DSW electrical level.

EC_UART_TxD0: EC UART #0, Serial data Transmit (output) line, +3.3V_DSW electrical level.

EC_UART_CTS#0: EC UART #0, Handshake signal, Clear to Send (Input) line, +3.3V_DSW electrical level.

EC_UART_RTS#0: EC UART #0, Handshake signal, Request to Send (output) line, +3.3V_DSW electrical level.

EC_UART_RxD1: EC UART #1, Serial data Receive (input) line, +3.3V_DSW electrical level.

EC_UART_TxD1: EC UART #1, Serial data Transmit (output) line, +3.3V_DSW electrical level.

EC_UART_CTS#1: EC UART #1, Handshake signal, Clear to Send (Input) line, +3.3V_DSW electrical level.

EC_UART_RTS#1: EC UART #1, Handshake signal, Request to Send (output) line, +3.3V_DSW electrical level.

3.3.14 IR Receiver

The UDOO BOLT board embeds an IR receiver, which allows using a remote control when the board is placed in an enclosure (like, i.e., on Set Top Boxes).

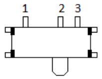
The Infrared Receiver is SMD Type, p/n TSOP75238TR, and works with 38kHz carrier frequency.

The IR port is managed by the embedded microcontroller.

3.3.15 UEFI BIOS Default Restore switch

In some cases, a wrong configuration of BIOS parameters could lead the module in an unusable state (i.e. no video output, all USB HID devices disabled).

For these cases, on the module it has been placed a 3-way switch which can be used to restore the BIOS to factory default configuration. To do so, it is necessary to place the contact of the switch in 1-2 position, then turn on the module, wait until the board resets itself then turn off the module. The contact MUST be now placed back to 2-3 position.



During normal use, the contact MUST be always placed in 2-3 position.

Chapter 4.
UEFI BIOS SETUP

- Aptio setup Utility
- Main menu
- Advanced menu
- Chipset menu
- Security menu
- Boot menu
- Save & Exit menu

4.1 Aptio setup Utility

Basic setup of the board can be done using American Megatrends, Inc. “Aptio Setup Utility”, that is stored inside an onboard SPI Serial Flash.

It is possible to access to Aptio Setup Utility by pressing the <ESC> key after System power up, during POST phase. On the splash screen that will appear, select “SCU” icon.

On each menu page, on left frame are shown all the options that can be configured.

Grayed-out options are only for information and cannot be configured.

Only options written in blue can be configured. Selected options are highlighted in white.

Right frame shows the key legend.

KEY LEGEND:

← / → Navigate between various setup screens (Main, Advanced, Security, Power, Boot...)

↑ / ↓ Select a setup item or a submenu

+ / - + and - keys allows to change the field value of highlighted menu item

<F1> The <F1> key allows displaying the General Help screen.

<F2> Previous Values

<F3> <F3> key allows loading Optimised Defaults for the board. After pressing <F3> BIOS Setup utility will request for a confirmation, before loading such default values. By pressing <ESC> key, this function will be aborted

<F4> <F4> key allows save any changes made and exit Setup. After pressing <F10> key, BIOS Setup utility will request for a confirmation, before saving and exiting. By pressing <ESC> key, this function will be aborted

<ESC> <Esc> key allows discarding any changes made and exit the Setup. After pressing <ESC> key, BIOS Setup utility will request for a confirmation, before discarding the changes. By pressing <Cancel> key, this function will be aborted

<ENTER> <Enter> key allows to display or change the setup option listed for a particular setup item. The <Enter> key can also allow displaying the setup sub- screens.

It is possible to reset the UEFI BIOS Setup to Factory Defaults by using the dedicated switch available on module. Please check par. 3.3.15.

4.2 Main menu

When entering the Setup Utility, the first screen shown is the Main setup screen. It is always possible to return to the Main setup screen by selecting the Main tab.

In this screen, are shown details regarding BIOS version, Processor type, Bus Speed and memory configuration.

Only two options can be configured:

4.2.1 System Time / System Date

Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values directly through the keyboard, or using + / - keys to increase / reduce displayed values. Press the <Enter> key to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

Note: The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

The system date is in the format mm/dd/yyyy.

4.3 Advanced menu

Menu Item	Options	Description
AMD CBS	See submenu	AMD CBS Setup Page
AMD PBS	See submenu	AMD PBS Setup Page
Battery Failure manager	See submenu	Sets the action to be performed in case of battery failure
Trusted Computing	See submenu	Trusted Computing Settings
ACPI Settings	See submenu	System ACPI parameters
SATA presence	See submenu	SATA devices Configuration
DXIO Settings	See submenu	PEG, PCIE and DDI Lanes configuration
S5 RTC Wake Settings	See submenu	Enable System to wake from S5 using RTC alarm
Serial Port Console Redirection	See submenu	Serial Port Console redirection
CPU Configuration	See submenu	CPU Configuration Parameters
AMI Graphic Output Protocol Policy	See submenu	User Selected Monitor Output by Graphic Output protocol
PCI Subsystem Settings	See submenu	PCI Subsystem Settings
Network Stack Configuration	See submenu	Network Stack Settings
CSM Configuration	See submenu	Compatibility Support Module (CSM) Configuration: Enable/Disable, Option ROM execution Settings, etc...
NVMe Configuration	See submenu	NVMe Device Options Settings
SDIO Configuration	See submenu	SDIO Configuration Parameters
USB Configuration	See submenu	USB Configuration Parameters
Main Thermal Configuration	See submenu	Main thermal Configuration
SMBIOS Information	See submenu	SMBIOS Information

4.3.1 AMD CBS submenu

Menu Item	Options	Description
NBIO Common options	See submenu	NorthBridge IO Configuration Options
FCH Common options	See submenu	Firmware Controller Hub Configuration options

4.3.1.1 NBIO Common Options submenu

Menu Item	Options	Description
GFX Configuration	See submenu	GFX Configuration options
IOMMU	Auto / Disabled / Enabled	Enable or disable the support for IOMMU (IO Memory Management Unit. Also known as AMD Virtualization™ Technology).
PSPP Policy	Disabled Performance Balanced-high Balanced-Low Power Saving Auto	PCIe Speed Power policy: the processor can dynamically support the changing to the link frequency due to changes in system configuration and power policy.
System Configuration	12W POR Configuration/ 15W POR Configuration/ 25W POR Configuration/ 35W POR Configuration/ 45W POR Configuration/ 54W POR Configuration/ Auto	Allows selecting the Power Scheme configuration for the CPU. Warning: by selecting a precise configuration, may cause the system to hang, as some System Configurations may not be supported by your OPN.
Audio Codecs	Enabled Disabled	Disable/Enable Audio Codecs input signals SDINx

4.3.1.1.1 GFX Configuration submenu

Menu Item	Options	Description
Integrated Graphics Controller	Auto / Disabled / Forces	Enable Integrated Graphics Controller. If disabled, all the remaining options will disappear
UMA Mode	Auto / UMA_Specified / UMA_Auto	Only available when Integrated Graphics Controller is set to “Forces”. Allows setting the Unified Memory Architecture (UMA) Frame Buffer Size or Display Resolution
UMA Version	Legacy / Non-Legacy / Hybrid Secure / Auto	Only available when Integrated Graphics Controller is set to “Forces”. Sets the supported UMA compatibility.
UMA Frame Buffer Size	Auto / 256M / 384M / 512M / 768M / 1G / 2G / 3G / 4G / 8G / 16G	Only available when “UMA Mode” is set to UMA_Specified. Sets UMA Frame Buffer Size
Display Resolution	1920X1080 and below / 2560x1600 / 3840x2160 / Auto	Only available when “UMA Mode” is set to UMA_Auto. Sets Display Resolution
Integrated HD Audio Controller	Auto / Disabled / Enabled	Enables or disabled integrated HD Audio Controller

4.3.1.2 FCH Common Options submenu

Menu Item	Options	Description
SATA Configuration Options	See submenu	SATA Configuration Options
Uart Configuration Options	See submenu	Uart Configuration Options
eMMC Options	See submenu	eMMC Configuration Options

4.3.1.2.1 SATA Configuration submenu

Menu Item	Options	Description
SATA Controller	Auto / Disabled / Enabled	Enable or Disable on-chip SATA controller
SATA Mode	AHCI AHCI as ID 0x7904 Auto RAID	Only available when SATA Controller is set to “Enabled”. Select on-chip SATA Type

4.3.1.2.2 Uart Configuration Options submenu

Menu Item	Options	Description
SER1 Enable SER0 Enable	Auto Disabled Enabled	Enable or Disable SER0 and SER1 ports available on COM Express connector AB.

4.3.1.2.3 eMMC Options submenu

Menu Item	Options	Description
eMMC/SD Configure	Disabled eMMC High Speed SDR eMMC High Speed DDR eMMC HS200 eMMC HS400 eMMC HS300	Configures eMMC Speed Mode
Driver Type	AMS eMMC Driver MS Driver MS eMMC Driver Auto	BIOS will select MS driver for SD selection
D3 Cold Support	Auto / Disabled / Enabled	
eMMC Boot	Auto / Disabled / Enabled	Enables or disables the boot from eMMC drive

4.3.2 AMD PBS submenu

Menu Item	Options	Description
AMD Firmware Version		Opens an information page with all details about the Firmware
Primary Video Adaptor	Int. Graphics (IGD) Ext. Graphics (PEG)	Allows to select if Internal Graphics controller (IGD) or external PCI-e Graphic Controller x8 (PEG) should be used as a Primary display

4.3.3 Battery Failure Manager submenu

Menu Item	Options	Description
Battery Failure Action	None Restore Defaults Restore NVRAM	Sets the action that must be done when a backup battery failure occurs. None: no action Restore defaults: restore BIOS factory default, preserving the password(s) Reset NVRAM: restore all factory defaults, clearing also the password(s)

4.3.4 Trusted computing submenu

Menu Item	Options	Description
Security Device Support	Disabled / Enabled	Enables or Disables BIOS Support for security devices. OS will not show Security Device, TCG EFI protocol and INT1A interface will not be available. When disabled, all following items will disappear.
SHA-1 PCR Bank	Disabled / Enabled	Enables or Disables SHA-1 PCR Bank
SHA256 PCR Bank	Disabled / Enabled	Enables or Disables SHA256 PCR Bank
Pending operation	None TPM Clear	Schedule an operation for the Security Device. Note: your computer will reboot during restart in order to change the State of Security Device.
Platform Hierarchy	Disabled / Enabled	Enable or Disable Platform Hierarchy
Storage Hierarchy	Disabled / Enabled	Enable or Disable Storage Hierarchy
Endorsement Hierarchy	Disabled / Enabled	Enable or Disable Endorsement Hierarchy
TPM2.0 UEFI Spec Version	TCG_1_2 TCG_2	Select the TCG2 Spec version Support. TCG_1_2 is the compatible mode for Windows 8 and Windows 10 TCG_2 supports the new TCG2 protocol and event format for Windows 10 and later
Physical Presence Spec Version	1.2 / 1.3	Tells the OS to support PPI Spec version 1.2 or 1.3. Note that some HCK tests might not support 1.3
Device Select	Auto TPM 1.2 TPM 2.0	TPM 1.2 will restrict the support to TPM 1.2 devices only, TPM 2.0 will restrict the support to TPM 2.0 devices only, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated

4.3.5 ACPI Settings

Menu Item	Options	Description
Enable ACPI Auto Configuration	Disabled / Enabled	Enables or Disables BIOS ACPI Auto Configuration. The following menu items will appear only when this menu item is Disabled
Enable Hibernation	Disabled / Enabled	Enables or disables system ability to Hybernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Suspend Disabled S3 (Suspend to RAM)	Select the highest ACPI Sleep state the system will enter when the SUSPEND button is pressed.
Lock Legacy resources	Disabled / Enabled	Enables or Disables Lock of Legacy resources

4.3.6 SATA presence submenu

Menu Item	Options	Description
M.2 (CN18 Key B SATA) Standard (CN14) SATA		Shows information related to eventual devices connected to SATA ports 0 or 1.

4.3.7 DXIO Settings submenu

Menu Item	Options	Description
DDI Port	See submenu	Allows enabling and configuring the single DDI ports
PEG Port	See submenu	Allows enabling and configuring the PEG port(s)
PCI-E Port	See submenu	Allows enabling and configuring the PCI-e ports

4.3.7.1 DDI Port submenu

Menu Item	Options	Description
HDMI0 (CN20) State HDMI1 (CN19) State USB-C1 (CN9) DP State USB-C0 (CN8) DP State	Disabled Enabled	Enable or Disable individually the video interfaces

4.3.7.2 PEG Port submenu

Menu Item	Options	Description
M.2 x4 (CN17 Key M)	Enabled / Disabled	Enable or disable the PEG x4 port available on M.2 Key M (NVMe) slot. When enabled, all following items will appear.
ASPM Mode Control	Disabled L0s Entry L1 Entry L0s and L1 Entry Auto	Disable or Enable PCI Express Active State Power Management
Link Speed	PCIe Gen1 PCIe Gen2 Max Speed Auto	Configures NB Root Port PCIe Link Speed, which can however be overwritten by PSPP Settings
Hot Plug Mode Control	Auto Disabled Hotplug Basic Hotplug Server Hotplug Enhanced Hotplug Inboard	PCI Express Root Port Hot Plug Mode Control
Compliance Mode	Enabled / Disabled	If enabled, forces the port into Compliance mode.

4.3.7.3 PCI-E Port submenu

Menu Item	Options	Description
M.2 x2 (CN18 Key B) M.2 x1 (CN16 Key E) Internal LAN	Enabled / Disabled	Enable or disable each single PCIE port . When enabled, all following items will appear.
ASPM Mode Control	Disabled L0s Entry L1 Entry L0s and L1 Entry Auto	Disable or Enable PCI Express Active State Power Management
Link Speed	PCIe Gen1 PCIe Gen2 Max Speed Auto	Configures NB Root Port PCIe Link Speed, which can however be overwritten by PSPP Settings
Hot Plug Mode Control	Auto Disabled Hotplug Basic Hotplug Server Hotplug Enhanced Hotplug Inboard	PCI Express Root Port Hot Plug Mode Control
Compliance Mode	Enabled / Disabled	If enabled, forces the port into Compliance mode.

4.3.8 S5 RTC Wake Settings submenu

Menu Item	Options	Description
Wake system from S5	Disabled By Every Day By Day of Month	Enables or disables System Wake on Alarm event. The following menu items will appear only when this voice is not set to Disabled
Wake up hour	0..23	Sets the wake up hour in 0..23 format (i.e.,3 means 3am, 15 means 3pm)
Wake up minute	0..59	Sets the wake up minute
Wake up second	0..59	Sets the wake up second
Day of Month	1..31	This item is available only when "Wake system from S5" is set to "By Day of Month". Sets the day of month for Wake on Alarm event. Valid range s from 1 to 31, error checking will be done against month/day/year combinations that are not valid.

4.3.9 Serial Port Console Redirection submenu

Menu Item	Options	Description
Console Redirection	Enabled / Disabled	Enable or disable Console redirection. This can be done both on Serial Port 0 and Serial Port 1 and for Windows Emergency Management Services (EMS) console.
Console Redirection Settings	See submenu	When any of the Serial port Console Redirections is enabled, this submenu will appear

4.3.9.1 Console Redirection Settings submenus

Menu Item	Options	Description
Terminal Type	VT_100 / VT_100+ / VT_UTF8 / ANSI	Set Console Redirection terminal type
Bits per second	115200 / 57600 / 38400 / 19200 / 9600	Set Console Redirection baud rate
Data Bits	7 / 8	Set Console Redirection data bits
Parity	None / Even / Odd / Mark / Space	Set Console Redirection parity bits
Stop Bits	1 / 2	Set Console Redirection stop bits
Flow Control	None Hardware RTS/CTS	Set Console Redirection flow control type
VT-UTF8 Combo Key Support	Enabled / Disabled	Enable or Disable VT-UTF8 Combination Key Support for ANSI/VT100 terminals
Recorder Mode	Enabled / Disabled	With this mode enabled only text will be sent. This is to capture Terminal data.
Resolution 100x31	Enabled / Disabled	Enables or disables extended terminal resolution
Putty Keypad	VT100 / Linux / XTermr6 / SCO / ESCN / VT400	Select FunctionKey and KeyPad on Putty

4.3.10 CPU configuration submenu

Menu Item	Options	Description
PSS Support	Enabled / Disabled	Enable/disable the generation of ACPU _PCC, _PSS and _PCT objects
PPC Adjustment	PState 0 / PState 1 / PState 2	Only Available when PSS Support is enabled Provide to adjust startup P-state level
NX Mode	Enabled / Disabled	Enables or Disables No-execute Page Protection Function
SVM Mode	Enabled / Disabled	Enables or disables CPU Virtualization
Node 0 Information		Opens an information page with the Memory Information details related to Node 0

4.3.11 AMI graphic Output Protocol Policy submenu

Menu Item	Options	Description
Output Select	*List of available / connected module's video interfaces*	

4.3.12 PCI Subsystem Settings submenu

Menu Item	Options	Description
Above 4G Decoding	Disabled / Enabled	Globally Enables or Disables 64-bit capable Devices to be decoded in Address Space above 4GB (only if system supports 64-bit PCI Decoding).
SR-IOV Support	Disabled / Enabled	If system has SR-IOV capable PCIe Devices, this option Enables or Disables Single Root IO Virtualization Support.
BME DMA Mitigation	Disabled / Enabled	Re-enable Bus Master Attribute disabled during PCI enumeration for PCI Bridges after SMM has been locked

4.3.13 Network Stack configuration submenu

Menu Item	Options	Description
Network Stack	Enabled / Disabled	Enables or disables UEFI Network Stack. When enabled, following menu items will appear
Ipv4 PXE Support	Enabled / Disabled	Enables or disables IPV4 PXE Boot Support. If disabled, IPV4 PXE boot option will not be created
Ipv4 HTTP Support	Enabled / Disabled	Enables or disables IPV4 HTTP Boot Support. If disabled, IPV4 HTTP boot option will not be created
Ipv6 PXE Support	Enabled / Disabled	Enables or disables IPV6 PXE Boot Support. If disabled, Ipv6 PXE boot option will not be created
Ipv6 HTTP Support	Enabled / Disabled	Enables or disables IPV6 HTTP Boot Support. If disabled, Ipv6 HTTP boot option will not be created
IPSEC certificate	Enabled / Disabled	Support to Enable/Disable IPSEC certificate for Ikev.
PXE boot wait time	[0..5]	Wait time to press ESC key to abort the PXE boot
Media detect count	[1..50]	Number of times that the presence of media will be checked

4.3.14 CSM configuration submenu

Menu Item	Options	Description
CSM Support	Enabled / Disabled	Enables or disables the Compatibility Support Module (CSM) Support. When enabled, the following menu items will appear
GateA20 Active	Upon Request Always	Upon Request: GateA20 can be disabled using BIOS services, Always: do not allow disabling GateA20; this option is useful when any RT code is executed above 1MB.
INT19 Trap Response	Immediate Postponed	BIOS Reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot
Boot option filter	UEFI and Legacy Legacy only UEFI only	This option controls Legacy / UEFI ROMs priority
Network	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy PXE OpROM
Storage	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy Storage OpROM
Video	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy Video OpROM
Other PCI devices	Do not launch UEFI Legacy	Determines the OpROM execution policy for devices other than Network, Storage and Video

4.3.15 NVMe configuration submenu

NVMe Device Options Settings, depend on NVMe Devices found in the system.

4.3.16 SDIO configuration submenu

Menu Item	Options	Description
SDIO Access Mode	Auto ADMA SDMA PIO	Auto option: Access to SD Device in DMA Mode, if the controller supports it, otherwise in PIO Mode. DMA option: Access the SD Device in DMA mode only. PIO option: Access the SD Device in PIOmode only.
MMC – *Name and capacity*	Auto Floppy Forced FDD Hard Disk	Mass storage device emulation type. With 'Auto', enumerates devices less than 530MB as Floppies. Forced FDD option can be used to force HDD formatted rive to boot as a FDD.

4.3.17 USB configuration submenu

Menu Item	Options	Description
Legacy USB Support	Enabled / 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.
XHCI hand-off	Enabled/ Disabled	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Enabled/ Disabled	Enables or disables USB Mass Storage Driver Support
USB Transfer time-out	1 sec / 5 sec / 10 sec / 20 sec	Sets the time-out value for Control, Bulk and Interrupt transfers
Device reset time-out	10 sec / 20 sec / 30 sec / 40 sec	USB mass storage device Start Unit command time-out
Device power-up delay	Auto / Manual	Sets the maximum time that the device will take before it properly reports itself to the Host controller. 'Auto' uses the default vale (for a Root port it is 100ms, for a Hub port the delay is taken from the Hub descriptor).
Device power-up delay in seconds	[1..40]	Delay range in seconds, in one second increment

4.3.18 Main Thermal Configuration submenu

Menu Item	Options	Description
Critical Temperature (°C)	80 .. 100	Above this threshold, an ACPI aware OS will perform a critical shut-down. Allowed range is from 80 to 100, where 100 means disabled.
Passive Cooling Temperature (°C)	75 .. 90	This value controls the temperature of the ACPI Passive Trip Point - the point in which the OS will begin lowering the CPU speed. Allowed range is from 75 to 90, where values above Critical Temperature means Disabled.

4.3.19 SMBIOS Information

Display only screen, shows information about the module and the Carrier board.

4.4 Chipset menu

Menu Item	Options	Description
South Bridge	See Submenu	South Bridge Parameters
North Bridge	See Submenu	North Bridge Parameters

4.4.1 South Bridge Configuration submenu

Menu Item	Options	Description
SB USB Configuration	See submenu	USB configuration Settings

4.4.1.1 SB USB Configuration submenu

Menu Item	Options	Description
USB-C0 (CN8) USB state Front Panel USB0 (CN21) Front Panel USB0 (CN22) USB-C0 (CN9) USB state M.2 x1 (CN16 Key E) USB State Arduino USB state	Enabled / Disabled	Enables or Disables every USB Port

4.4.2 North Bridge Configuration submenu

Menu Item	Options	Description
Socket 0 Configuration Socket 1 Configuration		By selecting this item, an information screen with all information related to the memory module plugged in Socket #x will appear

4.5 Security menu

Menu Item	Options	Description
Administrator Password		Set Administrator Password
User Password		Set User Password (possible only if also Administrator Password has been set)
Secure Boot	See Submenu	Customizable Secure Boot Settings

4.5.1 Secure Boot submenu

Menu Item	Options	Description
Secure Boot	Enabled / Disabled	Secure Boot is activated when the Platform Key (PK) is enrolled, System Mode is User/Deployed and CSM function is disabled.
Secure Boot Customization	Standard / Custom	Set UEFI Secure Boot Mode to Standard Mode or Custom mode. In Custom Mode, Secure Boot Policy variables can be configured by a physically present user without full authentication
Restore Factory Keys		Only accessible when Secure Boot Mode is set to Custom Force System to User Mode. Install Factory default Secure Boot key databases.
Reset to Setup Mode		Delete all Secure Boot key databases from NVRAM
Key management	See submenu	Only accessible when Secure Boot Mode is set to Custom Enable expert users to modify Secure Boot Policy variables without full authentication

4.5.1.1 *Key Management submenu*

Menu Item	Options	Description
Factory Key Provision	Disabled / Enabled	Install factory default Secure Boot Keys after the platform reset and while the System is in Setup Mode
Restore Factory Keys		Force System to User Mode. Install factory Default Secure Boot key databases
Reset to Setup Mode		Delete all Secure Boot key databases from NVRAM
Export Secure Boot variables		Copy NVRAM content of Secure Boot variables to files in a root folder on a file system device
Enrol Efi Image	*File System Image*	Allow the selected image to run in Secure Boot mode. Enrol SHA256 Hash Certificates of a PE Image into Authorized Signature Database (db)
Remove 'UEFI CA' from DB		Device Guard ready system must not list 'Microsoft UEFI CA' Certificate in Authorized Signature Database (db)
Restore DB defaults		Restore DB variable to factory defaults
Platform key Key Exchange Keys Authorized Signatures Forbidden Signatures Authorized Timestamps OS Recovery Signatures	Details Export Update Delete	Enrol factory Defaults or load certificates from a file: 1. Public Key Certificate in: a) EFI_SIGNATURE_LIST b) EFI_CERT_X509 (DER encoded) c) EFI_CERT_RSA2048 (bin) d) EFI_CERT_SHAXX 2. Authenticated UEFI variables 3. EFI PE/COFF Image (SHA256) Key Source: Factory, External, Mixed

4.6 Boot menu

Menu Item	Options	Description
Setup Prompt Timeout	0 .. 65535	Number of seconds to wait for setup activation key. 655535 means indefinite waiting.
Bootup NumLock State	On / Off	Select the Keyboard NumLock State at boot
Quiet Boot	Enabled / Disabled	Enables or Disables Quiet Boot options
Fast Boot	Enabled / Disabled	When Fast Boot is enabled, most probes are skipped to reduce time cost during boot
New Boot Option Policy	Default Place First Place Last	Controls the placement of newly detected UEFI boot devices
Boot Mode Select	LEGACY UEFI	Select the boot mode between Legacy and UEFI
Boot Option #1 Boot Option #2 Boot Option #3 Boot Option #4 Boot Option #5 Boot Option #6	Hard Disk CD/DVD SD USB Device Network UEFI Other Device Disabled	Select the system boot order

!

Please be aware that by default only UEFI boot is enabled. In this situation, when using legacy MBR drives, the system will not boot from them. To fully enable the boot form legacy drives, it is necessary to set the following items:

- Boot menu → “Boot mode select”: must be set to Legacy
- Advanced menu → CSM Configuration submenu → “CSM support” must be Enabled
- Advanced menu → CSM Configuration submenu → “Video” must be set to Legacy

4.7 Save & Exit menu

Menu Item	Options	Description
Save Changes and Exit		Exit system setup after saving the changes.
Discard Changes and Exit		Exit system setup without saving any changes.
Save Changes and Reset		Reset the system after saving the changes.
Discard Changes and Reset		Reset the system without saving any changes.
Save Changes		Save the changes done so far to any of the setup options.
Discard Changes		Discard the changes done so far to any of the setup options.
Restore Defaults		Restore/Load Default values for all the setup options
Save as User Defaults		Save the changes done so far as User Defaults
Restore User Defaults		Restore the User Defaults to all the setup options
Launch EFI Shell from filesystem device		Attempt to Launch the EFI Shell application (Shell.efi) from one of the available filesystem devices

Chapter 5.
APPENDICES

- Accessories

5.1 Accessories

5.1.1 M.2 Dual network modules

As a separated accessory, it is available an M.2 Dual Network Set, so composed:

- An M.2 2260 module, which embeds a PCI-e packet switch. It virtually separates the PCI-e x2 Port, coming from the UDOO BOLT board (through M.2 Slot CN18), into two separated PCI-e ports, each one used specifically to manage a Gigabit Ethernet controller. The Gigabit Ethernet interfaces, coming from the controllers, are then carried to a connector type HR A1014WVA-S-2x15P or equivalent (2 x 15p, male, straight, P1, low profile, polarised).
- A daughter-board, which mounts a connector identical to that available on the main M.2 module and two RJ-45 Gigabit Ethernet connectors with integrated transformer.
- Twisted pairs connecting cable, to connect the M.2 module with the daughter-board.

When this accessory is plugged into M.2 slot CN18, the UDOO BOLT board will offer three different Gigabit Ethernet ports.

5.1.2 I/O Expansion board

As a separated accessory, it is available an I/O Expansion board, which can be plugged directly on UDOO BOLT connectors CN24 and CN25, which will offer the interfaces described below.

Controlled by ATmega32u4 controller through CN24 connector

- 1x Arduino™ Leonardo Pinout R3
- UDOO Bricks Connector
- SPI Male pin header (interface managed by on-board ATmega32u4 controller

Controller by the Embedded controller through CN25 connector

- 4+5 pins male headers for 2x multistandard COM ports (RS-232/RS-422/RS-485 configurable via dip switch)
- 10-pin male header for 2x I2C
- 2x I2C EEPROM sockets
- 2x SPI Flash sockets
- 1x CAN Bus terminal block connector (realised using an SPI Controller on-module)
- 1x FAN Connector
- 1x Pin male connector for the 16x Keyboard Scan signals
- 4x5 Buttons matrix

SECO S.p.A. - Via Calamandrei 91
52100 Arezzo - ITALY
Ph: +39 0575 26979 - Fax: +39 0575 350210
www.udoo.org