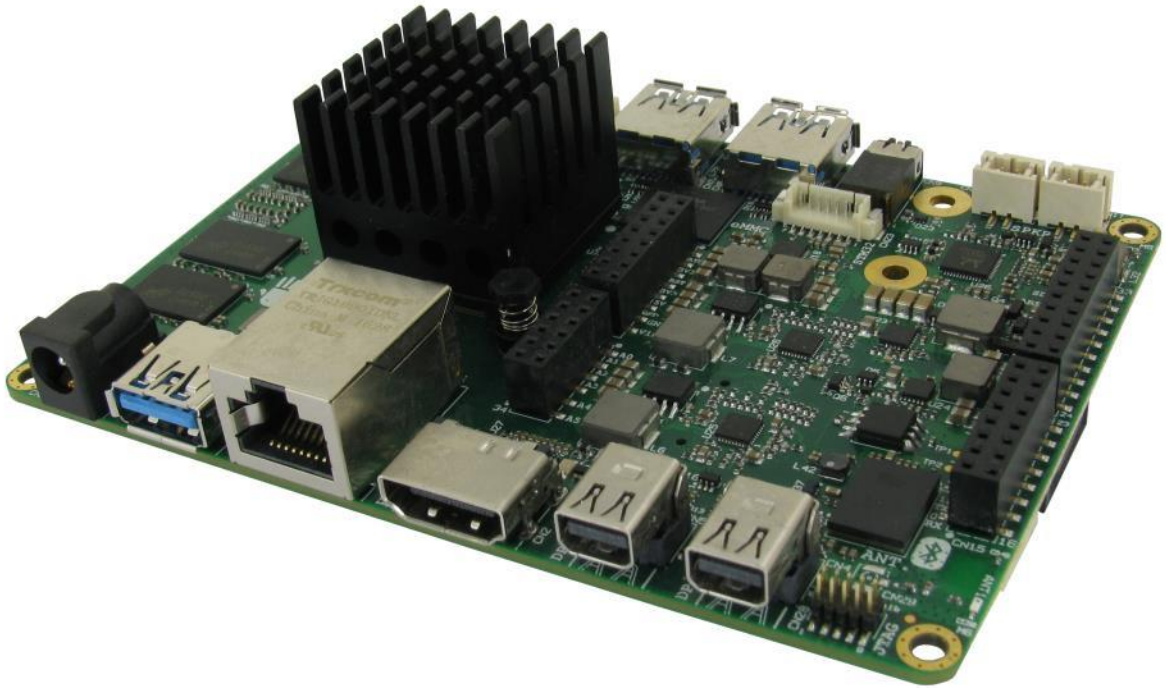
X86

User Manual



UDOO X86

Next-gen Open hardware SBC with the N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs

www.udoo.org

REVISION HISTORY

Revision	Date	Note	Ref
1.0	30th March 2017	First Official Release.	SB
1.1	3rd May 2017	Minor corrections. M.2 Key B specifications updated UEFI BIOS Section updated	SB
1.2	9th June 2017	Block Diagram SATA reference corrected FCC certification paragraph added	SB
1.3	4th August 2017	Minor corrections (DC barrel plug dimensions added in par. 2.3 CN22 connector's P/N and image corrected in par. 3.3.11)	SB
1.4	11th September 2017	UEFI BIOS Section updated (par. 4.3.4.4 , 4.5.3 updated)	
1.5	9th April 2018	FCC certification paragraph updated ISED certification paragraph added	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
- RMA number request
- Safety
- Electrostatic discharges
- RoHS compliance
- Terminology and definitions
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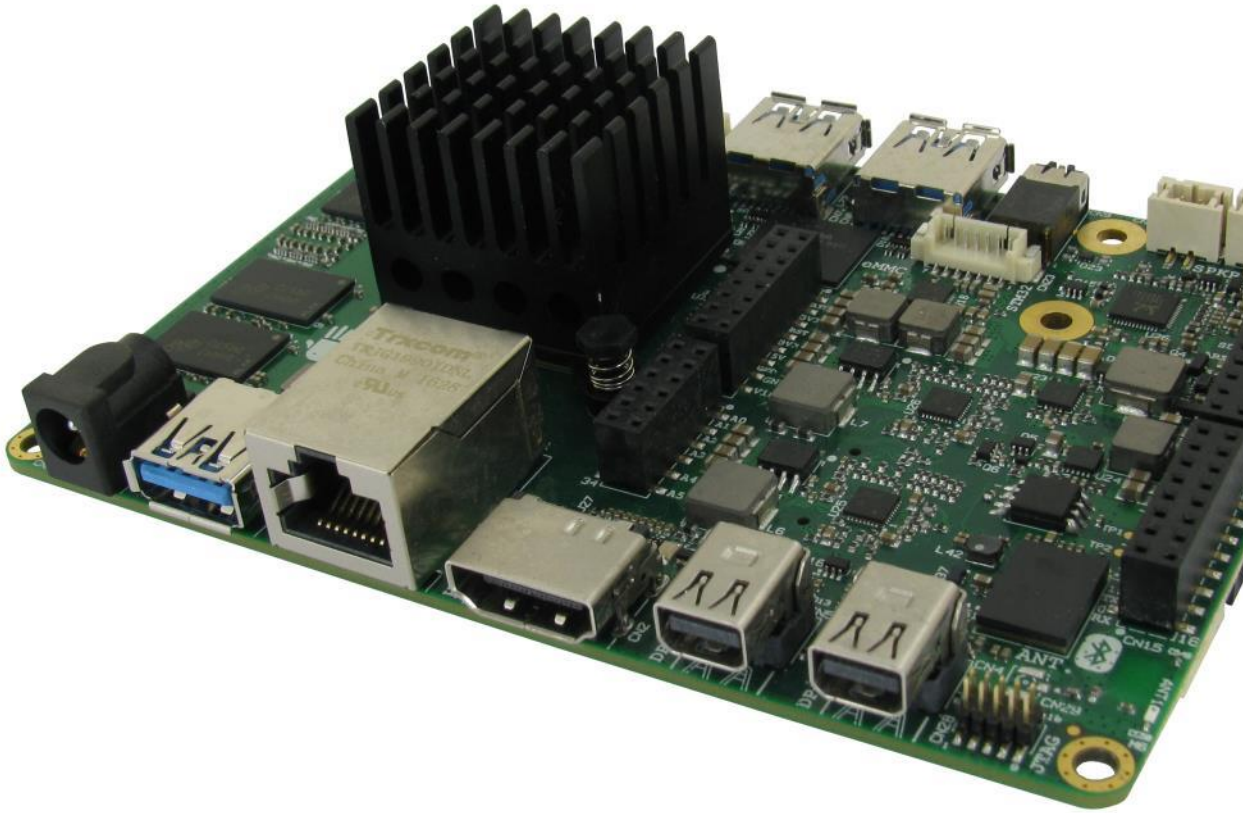


1.1 Warranty

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.r.l. 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 X86 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.

Always switch the power off, and unplug the power supply unit, before handling the board and/or connecting cables or other boards.

Avoid using metallic components - like paper clips, screws and similar - near the board when connected to a power supply, to avoid short circuits due to unwanted contacts with other board components.

If the board has become wet, never connect it to any external power supply unit or battery.

1.5 Electrostatic discharges

The UDOO X86 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.

Whenever handling a UDOO X86 board, ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended.

1.6 RoHS compliance

The UDOO X86 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 srl
Model: UDOO X86 Advanced Plus
FCC ID: 2ALZB-SECOFCC1
IC: 22688-SECOIC1

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
DDR3L	DDR, 3rd generation, Low voltage
DP++	Multimode Display Port, a video interface which can support both Display Port displays (directly) and HDMI/DVI displays (by using and external adapter)
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
IoT	Internet of Things
M.2	recent 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
S-ATA	Serial Advance Technology Attachment, a differential full duplex serial interface for Hard Disks
SD	Secure Digital, a memory card type
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
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

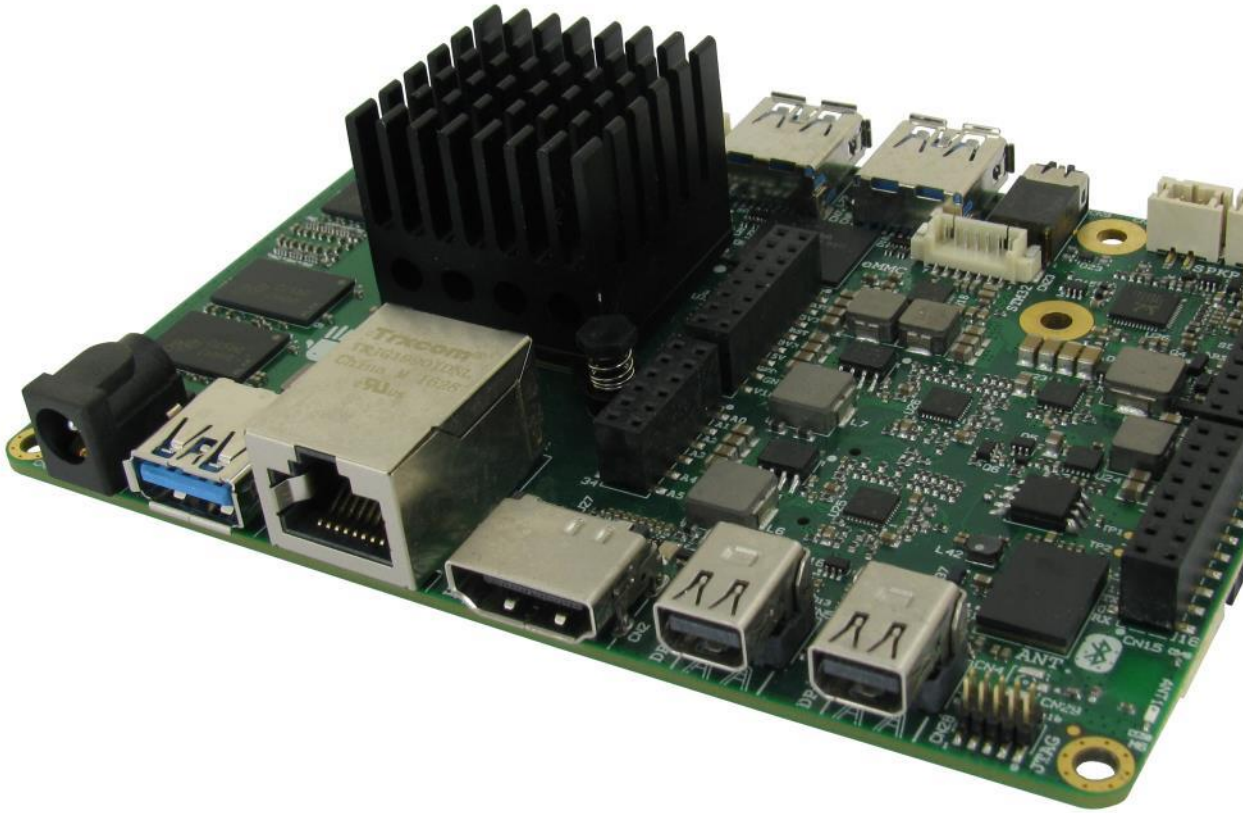
1.10 Reference specifications

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
Intel® N-Series Pentium® / Celeron® and x5-Series Atom™ family	http://ark.intel.com/products/codename/66094/Braswell#@Embedded

Chapter 2.
OVERVIEW

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



2.1 Introduction

UDOO-X86 is a board designed specifically for maker's / DIY market, embedding both a System-on-Chips (SoC) of the Intel® family of embedded SoCs formerly coded as Braswell, and an Arduino™ 101-compatible platform.

This board represents a junction point between the PC world, represented by the Braswell SoCs, and the Arduino™ 101 World, implemented on-board using an Intel® Curie™ microcontroller (the same used, indeed, in Arduino™ 101 boards).

All the SoCs mounted on UDOO X86 are Quad-Core, ranging from 2.00GHz up to 2.56 GHz, with 64-bit instruction set and very low TDP. This single chip solution includes the memory controller, which gives support for up to 8GB of DDR3L memory directly soldered on-board.

All SoCs embed an Intel® HD Graphics controller, with up to 16 Execution units, which offers high graphical performances, with support for Microsoft® DirectX11.1, OpenGL 4.2, OpenCL 1.2, OpenGL ES 3.0 and HW acceleration for video decoding of HEVC, H.264, MPEG2, MVC, VC-1, WMV9, JPEG/MJPEG and VP8 video standards (for H.264, MVC and JPEG/MJPEG also HW encoding is offered). This embedded GPU is able to drive three independent displays, by using the HDMI and the two miniDP++. Any combinations of these video interfaces are supported.

Other features offered by the N-Series Intel® Pentium® / Celeron® and x5-Series Atom™ family of SoCs, and included in UDOO X86 board, are two SATA Channels (one used for the common SATA / SSD drives, the other used to implement a M.2 Socket 2 Key B SSD slot), microSD interface, four USB ports (three USB 3.0 on standard Type-A sockets, 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 Intel® Curie™ microcontroller), HD Audio and four PCI Express lanes (a PCI express lane is used for the implementation of the Gigabit Ethernet interface, two lanes are carried out on M.2 Socket 2 Key B SSD slot, the remaining is available on M.2 Socket 1 Key E Connectivity Slot)

Through the Intel® Braswell SoC's USB interface #3 pass all the communications with the Intel® Curie™ microcontroller, which implements the Arduino 101 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.

The Intel® Curie™ microcontroller, however, not only implements the Arduino 101 interface, but also offers an embedded Bluetooth Low Energy interface (with on-board antenna) and 6-axis combo sensor with accelerometer and gyroscope.

All these features, combined together, make UDOO X86 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

Intel® Pentium® N3710, Quad Core @1.6GHz (Turbo Boost 2.56GHz), 2MB Cache, 6W TDP
Intel® Celeron® N3160, Quad Core @1.6GHz (Turbo Boost 2.24GHz), 2MB Cache, 6W TDP
Intel® Atom™ x5-E8000, Quad Core @1.04GHz, 2MB Cache, 5W TDP

Memory

Up to 8GB Dual Channel DDR3L Memory soldered on-board*

Graphics

Integrated Intel® HD Graphics controller
Three independent display support
HW decoding of HEVC(H.265), H.264, MPEG2, MVC, VC-1, VP8, WMV9, JPEG/MJPEG formats
HW encoding of H.264, MVC and JPEG/MPEG formats

Video Interfaces

HDMI connector
2 x miniDP++ connectors

Video Resolution

Up to 3840 x 2160 24bpp @ 30Hz, 2560 x 1600 24bpp @60Hz

Mass Storage

Optional 32GB eMMC drive onboard
SATA 7p M connector
M.2 Key B SSD slot (Type 2242 or 2260 modules accepted)
microSD Card slot

Networking

Realtek RTL811G Gigabit Ethernet controller
Gigabit Ethernet LAN interface
M.2 Key E Slot for optional Wireless modules
Embedded Bluetooth Low Energy module + antenna

** Please notice that total amount of 8GB would be usable only with 64-bit OS. Total amount of memory available with a 32-bit OS depends on the OS itself (less than 4GB, however).*

USB

3 x USB 3.0 Host ports on Type-A sockets
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

Audio

HD Audio Codec Realtek ALC283
Combo TRSS connector with Mic In and Line out support
S/PDIF signal
2 x Speaker internal headers

Serial ports

2 x UART with Flow Control ports

Other Interfaces

Up to 20 extended GPIOs, multiplexed with other interfaces
LPC, 2x I2C, T/S signals, GPIOs on expansion connector
I2C UDOO bricks connector
SPI Connector
Switch/LED Front Panel Header
CIR (Consumer InfraRed) Sensor
Arduino 101 compatible shield
Integrated 6-axis combo sensor with accelerometer and gyroscope

Power supply: +12V_{DC} ± 5%
RTC Coin cell Battery

Operating temperature: 0°C ÷ +60°C** (Commercial temperature)

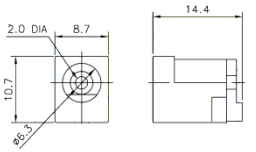
Dimensions: 120 x 85 mm (4.72” x 3.35”).

Supported Operating Systems:

Microsoft® Windows 10, 8.1, 7
Any Linux distribution for X86 64-bit platform
Android-x86

! *** Temperatures indicated are the maximum temperature that the heatspreader / heatsink can reach in any of its parts. This means that it is customer’s responsibility to use any passive cooling solution along with an application-dependent cooling system, capable to ensure that the heatspreader / heatsink temperature remains in the range above indicated.*

2.3 Electrical specifications



The UDOO X86 board needs to be supplied only with an external $12V_{DC}$ ± 5% power supply, minimum 36W for basic functionalities recommended.

This voltage can be supplied through a standard 6.3mm (internal pin, diameter 2.0 mm) Power Jack (CN21). Internal pin is V_{IN} power line.

Mating DC barrel plug: outer diameter 5.5mm, inner diameter 2.1mm.

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 Intel® SoC.

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

Battery connector - CN1	
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 53398-0271 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 X86 are compliant to requirements of European Directive 2006/66/EC regarding batteries and accumulators. When putting out of order UDOO X86, 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 X86 board, the current consumption (RMS) has been measured on the V_{IN} Power line when the board is supplied through DC power jack CN23 using a **+12V$_{DC}$** Notebook DC Adapter.

- O.S. Windows 10 Professional
- 32GB eMMC onboard
- USB mouse and keyboard connected
- HDMI display connected, resolution 1920x1080.
- UEFI BIOS Release 1.01

Status	SoC / Configuration		
	N3710 32GB eMMC 8GB RAM	N3160 32GB eMMC 4GB RAM	x5-E3800 32GB eMMC 2GB RAM
Inrush current at boot	920mA	748mA	542mA
Idle, power saving configuration	307mA	264mA	314mA
OS Boot, power saving configuration	454mA	342mA	316mA
Video reproduction@720p, power saving configuration	372mA	359mA	336mA
Video reproduction@1080p, power saving configuration	487mA	420mA	335mA
Internal Stress Test Tool, maximum performance	1008mA	1020mA	906mA

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

Battery Backup power consumption: 5.7µA
Soft-Off State power consumption: 53.7mA
Suspend State power consumption: 59.8mA

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

For this reasons, it is recommended to use PSU with a minimum power of 36W for basic functionalities

2.3.3 Power rails naming convention

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

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

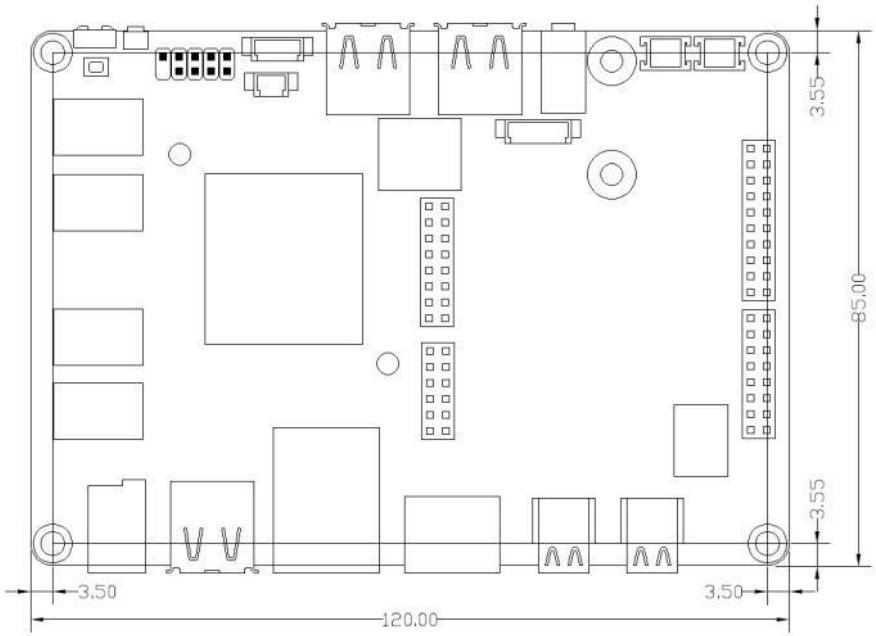
_A: Always-on voltages, i.e. power rails that are active both in ACPI's S0 (Working), S3 (Standby) and S5 (Soft Off) state. Examples: +5V_A, +3.3V_A.

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_S, and so on).

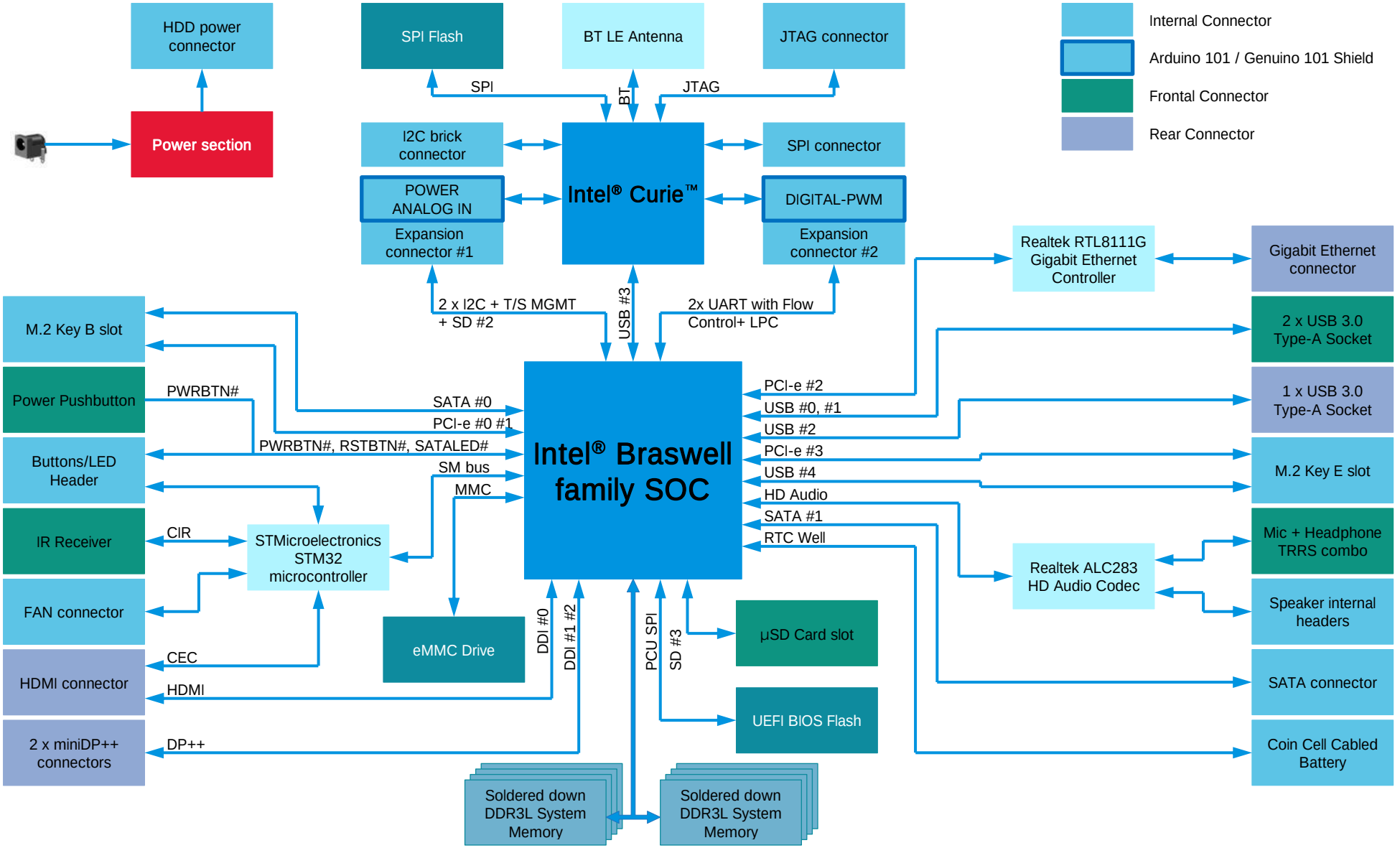
2.4 Mechanical specifications

The board dimensions are 120 x 85 mm (4.72” x 3.35”).

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

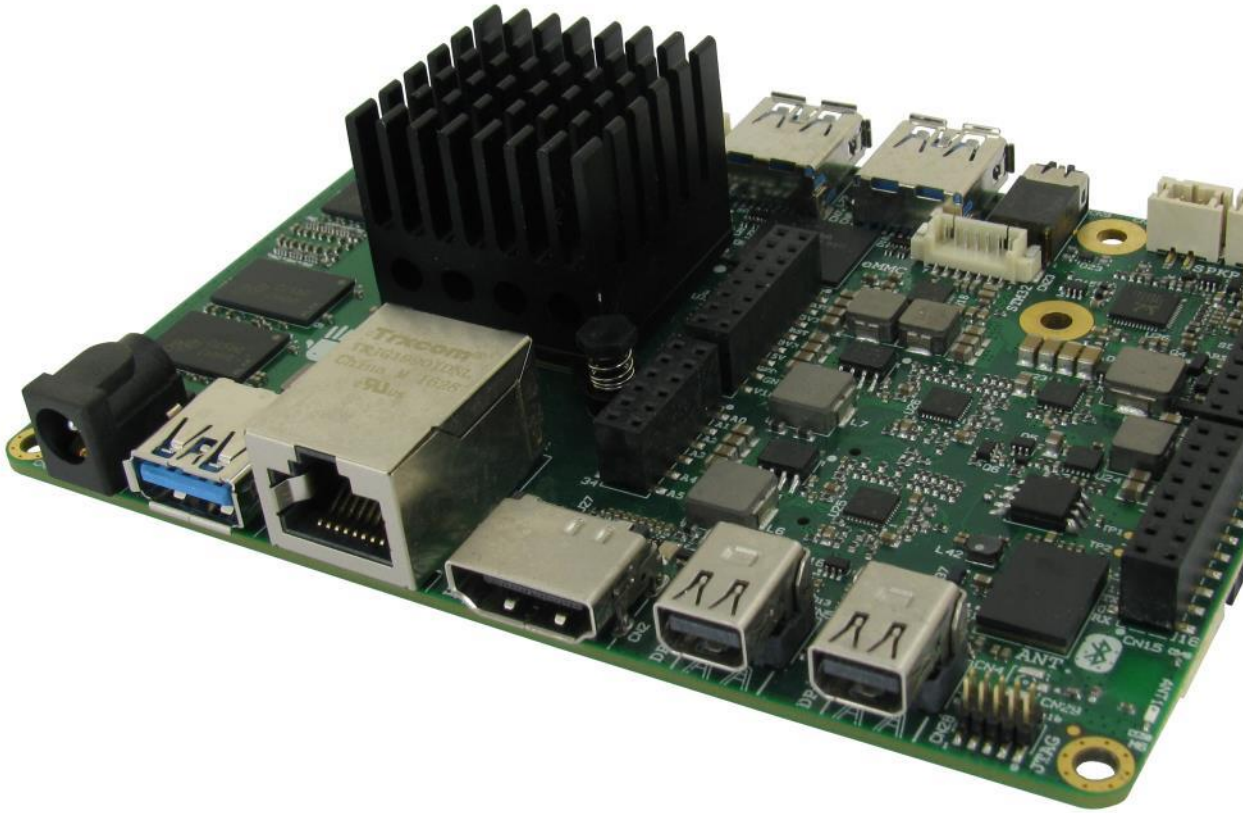


2.5 Block diagram



Chapter 3.
CONNECTORS

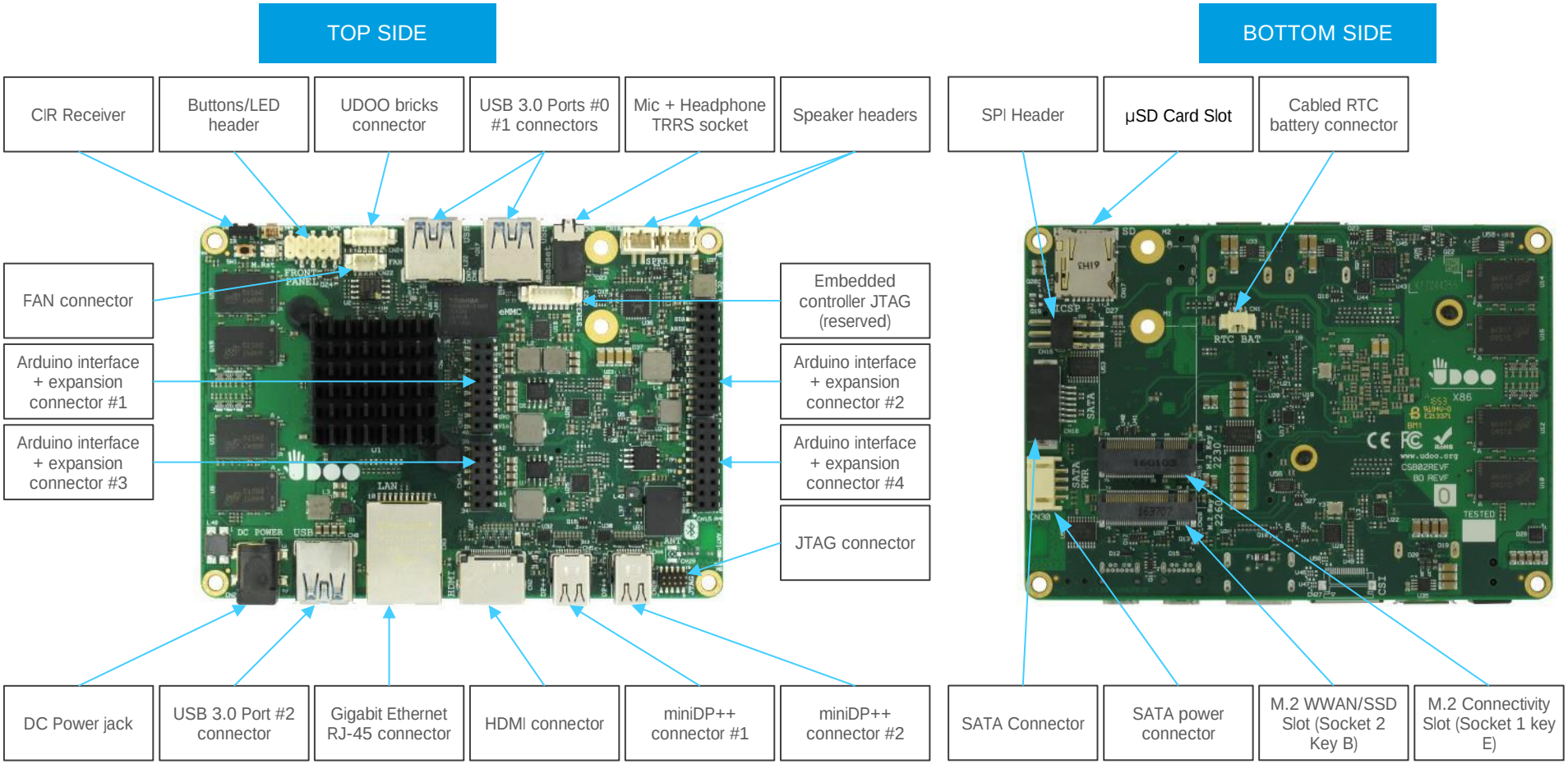
- Introduction
- Connectors overview
- Connectors description



3.1 Introduction

On UDOO X86 board, there are several connectors located on the upper plane. Standard connectors are placed on the same side of PCB, so that it is possible to place them on a panel of an eventual enclosure.

> **!** Please be aware that, depending on the configuration purchased, the appearance of the board could be slightly different from the following pictures.



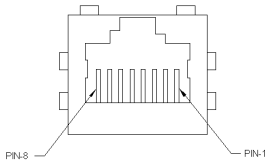
3.2 Connectors overview

Name	Description	Name	Description
CN1	Cabled RTC Battery	CN15	Arduino interface + expansion connector #4
CN2	HDMI connector	CN16	SPI Header
CN3	Gigabit Ethernet connector	CN17	µSD Card Slot
CN4	miniDP++ connector #2	CN18	SATA Port #1 M 7p connector
CN5	miniDP++ connector #1	CN19	M.2 Connectivity Slot (Socket 1 Key E Type 2230)
CN6	USB 3.0 Port #0	CN20	M.2 SATA/PCI-e Slot (Socket 2 Key B type 2242 / 3042 or 2260)
CN7	USB 3.0 Port #1	CN21	DC IN Power Jack
CN8	USB 3.0 Port #2	CN22	FAN Header 3p
CN9	Mic + Headphone TRRS socket	CN23	STM Controller JTAG Connector (reserved)
CN10	Right Speaker Connector	CN24	UDOO Bricks connector
CN11	Left Speaker Connector	CN25	Button/LED Internal Header
CN12	Arduino interface + expansion connector #1	CN28	JTAG connector
CN13	Arduino interface + expansion connector #2	CN30	SATA Power Connector
CN14	Arduino interface + expansion connector #3	U48	IR Receiver

3.3 Connectors description

3.3.1 Ethernet connector

Gigabit Ethernet Connector- CN3			
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 X86 module to a wired LAN.

The Ethernet connection is managed by a dedicated Realtek RTL8111G Gigabit Ethernet controller, interfaced to PCI-express port #2.

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.

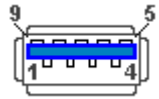
3.3.2 USB ports

The Intel® Braswell family of SoCs used on UDOO X86 board can manage up to four USB SuperSpeed (i.e., USB 3.0 compliant) ports and five High Speed (i.e. USB 2.0 compliant) ports. There is only one dedicated High Speed port, the other four ports are shared with the SuperSpeed ports, i.e. they can be used either by USB 2.0 or USB 3.0.

USB 3.0 port#0 type A receptacle - CN6

Pin	Signal	Pin	Signal
1	$+5V_{USB0}$	5	USB_SSRX0-
2	USB_P0-	6	USB_SSRX0+
3	USB_P0+	7	GND
4	GND	8	USB_SSTX0-
		9	USB_SSTX0+

The USB 3.0 ports #0 and #1 are available on two single USB connectors, CN6 and CN7, placed on the same side of the PCB ("Frontal"), while USB 3.0 port #2 is available on USB connector CN8 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.



Since these 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 3.0 or USB 2.0 plugs.

For USB 3.0 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 3.0 port#1 type A receptacle - CN7

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 3.0 port #2 type-A receptacle - CN8

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_P0+/USB_P0-: USB 2.0 Port #0 differential pair.

USB_SSRX0+/USB_SSRX0-: USB Super Speed Port #0 receive differential pair.

USB_SSTX0+/USB_SSTX0-: USB Super Speed Port #0 transmit differential pair.

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_P3+/USB_P4-: USB 2.0 Port #3 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.

> **!**
>
> Please be aware that Windows® 7 OS doesn't have native support for the xHCI controller. It will be supported only after installing chipset's driver. This could lead to problems during OS installation, since during this phase USB keyboard and mouse will not work, if connected to any of the USB ports available on UDOO X86 board.
>
> It is possible to force the UEFI BIOS support for Mouse and Keyboard on USB ports by entering "InsydeH2O Setup utility" ("Advanced" menu → "Other Configuration" submenu → "Win7 Keyboard/Mouse Support", see paragraph 4.3.9) before performing Windows® 7 and chipset's driver installation

3.3.3 HDMI connector

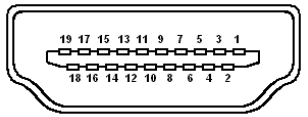
HDMI Connector - CN2			
Pin	**Signal**	**Pin**	**Signal**
1	TMDS_LANE2+	2	GND
3	TMDS_LANE2-	4	TMDS_LANE1+
5	GND	6	TMDS_LANE1-
7	TMDS_LANE0+	8	GND
9	TMDS_LANE0-	10	TMDS_CLK+
11	GND	12	TMDS_CLK-
13	CEC	14	---
15	SCL	16	SDA
17	GND	18	$+5V_{HDMI}$
19	HPD		

The Intel® Braswell family of SoCs offer three Digital Display Interfaces, configurable to work in HDMI/DVI/DP++ modes.

On the UDOO X86 board, the Digital Display Interface #0 is used to implement a HDMI interface.

Therefore, on-board it is available a standard certified HDMI connector, right-angle, type A, WIN WIN P/N WDMI-19F4L1BN5U1.

Signals involved in HDMI management are the following:



TMDS_CLK+/TMDS_CLK-: TMDS differential Clock.

TMDS_LANE0+/TMDS_LANE0-: TMDS differential pair #0

TMDS_LANE1+/TMDS_LANE1-: TMDS differential pair #1

TMDS_LANE2+/TMDS_LANE2-: TMDS differential pair #2

SDA: DDC Data line for HDMI panel. Bidirectional signal, electrical level $+5V_{HDMI}$ with a 2kΩ pull-up resistor.

SCL: DDC Clock line for HDMI panel. Output signal, electrical level $+5V_{HDMI}$ with a 2kΩ pull-up resistor.

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

HPD: Hot Plug Detect Input signal. +3.3V_S electrical level signal with 100kΩ pull-down resistor

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

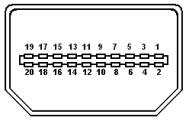
Always use HDMI-certified cables for the connection between the board and the HDMI display; a category 2 (High-Speed) cable is recommended for higher resolutions, category 1 cables can be used for 720p resolution.

3.3.4 miniDP++ Connectors

miniDP++ Connector # 1- CN5			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	DP1_HPD
3	DP1_LANE0+	4	CAD
5	DP1_LANE0-	6	HDMI1_CEC
7	GND	8	GND
9	DP1_LANE1+	10	DP1_LANE3+
11	DP1_LANE1-	12	DP1_LANE3-
13	GND	14	GND
15	DP1_LANE2+	16	HDMI1_CTRL_CLK / DP1_AUX+
17	DP1_LANE2-	18	HDMI1_CTRL_DAT / DP1_AUX-
19	GND	20	+3.3V_S

miniDP++ Connector #2- CN4			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	DP_HPD
3	DP2_LANE0+	4	CAD
5	DP2_LANE0-	6	HDMI2_CEC
7	GND	8	GND
9	DP2_LANE1+	10	DP2_LANE3+
11	DP2_LANE1-	12	DP2_LANE3-
13	GND	14	GND
15	DP2_LANE2+	16	HDMI2_CTRL_CLK / DP2_AUX+
17	DP2_LANE2-	18	HDMI2_CTRL_DAT / DP2_AUX-
19	GND	20	+3.3V_S

On the UDOO X86 board, the Digital Display Interfaces #1 and #2 are used to implement a multimode Display Port (DP++)interface, i.e. it can be used to support DP displays directly and, through an external adapter, also HDMI or DVI displays.



Such an interface is available on as many miniDP connectors, type Pulse Electronics p/n E9320-001-01 or equivalent, with the pinout shown in the table on the left.

The configuration of this interface in DP or HDMI/DVI mode is automatic, and it is driven by the CAD signals available on pin 4.

When a DP cable is connected, then the CAD signal is not connected; this interface will recognize it, and on pins 16/18 there will be the Display Port Auxiliary channel signals. Instead, when a DP-to-HDMI adapter is mounted, it will drive opportunely the CAD signal, which will make available HDMI_CTRL_CLK and HDMI_CTRL_DAT signals on the same pins.

Further signals involved in DP management are the following:

DPx_LANE0+/DPx_LANE0-: Display Port differential pair #0.

DPx_LANE1+/DPx_LANE1-: Display Port differential pair #1.

DPx_LANE2+/DPx_LANE2-: Display Port differential pair #2.

DPx_LANE3+/DPx_LANE3-: Display Port differential pair #3.

DPx_HPD: Hot Plug Detect Input signal.

HDMIx_CEC: HDMI Consumer Electronics Control (CEC) Line. This signal is used only for HDMI compatibility when a HDMI adapter is connected to the DP connector.

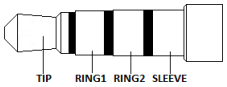
3.3.5 Audio interfaces

In the UDOO X86 board, audio functionalities are provided by a Realtek ALC283 High Definition Audio Codec.

TRRS Audio socket- CN9	
Pin	**Signal**
TIP	Headphone Out Left Channel
RING1	Headphone Out Right Channel
RING2	GND
SLEEVE	MIC_IN

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.

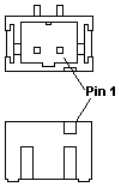
Such TRRS Combo Audio socket can be used with any 4-poles 3.5mm diameter audio jack, with pinout compatible with the most recent Headsets, shown in the table on the left.



Right Speaker Connector- CN10	
Pin	**Signal**
1	Speaker Right Channel +
2	Speaker Right Channel -

Additionally, it is also possible to connect external stereo speakers by using the dedicated connectors CN10 and CN11, 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.



Left Speaker Connector- CN11	
1	Speaker Left Channel -
2	Speaker Left Channel +

3.3.6 Buttons / LED header

Buttons / LED Header - CN25			
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 X86 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 signaling 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 CN25 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_S 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_A electrical level with 10kΩ pull-up.

PWR_SW_P: Power button input signal, +3.3V_A electrical level with 10kΩ 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 Consumer Infrared receiver.

PWR_SW_N: Power button GND

FP PWR_P/SLP_N: Power/Sleep messaging LED terminal 1 with 510Ω pull-up resistor to +5V_A voltage. Connect it to an extremity of a dual-color power LED for power ON/OF, sleep and message waiting signaling. 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_A voltage. Connect it to the other extremity of the dual-color power LED above mentioned.

3.3.7 µSD slot

The SoCs used on UDOO X86 module offer a SD 3.0 compliant interface, that can be used to implement another mass storages media other than the optional internal eMMC and the two SATA interfaces.

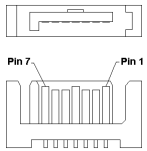
This SD interface is carried to a standard µSD card slot (CN17), soldered on top side of the module, push-push type.

3.3.8 S-ATA connectors

S-ATA Connector - CN18	
Pin	**Signal**
1	GND
2	SATA1_Tx+
3	SATA1_Tx-
4	GND
5	SATA1_Rx-
6	SATA1_Rx+
7	GND

The N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs 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, CN18 (the other SATA channel is available on the M.2 Key B socket, CN20, please check par. 3.3.9).



Here following the signals related to SATA interface:

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

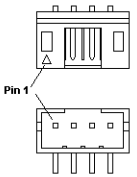
SATA1_RX+/SATA1_RX-: Serial ATA Channel #1 Receive differential pair

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

S-ATA Power Connector - CN30	
Pin	**Signal**
1	---
2	GND
3	GND
4	+5V_S

A dedicated power connector, CN21, 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.

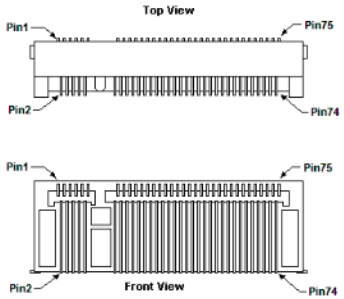


Mating connector: JST PHR-4 crimp housing with JST SPH-002T-P0.5L crimp terminals.

3.3.9 M.2 SATA/PCI-e Slot: Socket 2 Key B type 2242/3042/2260

M.2 SATA/PCI-e Slot - CN20			
Pin	**Signal**	**Pin**	**Signal**
1	---	2	+3.3V_S
3	GND	4	+3.3V_S
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 X86 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 CN20, 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 X86 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 3042 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 CN20 slot and the connectivity modules plugged in CN19 slot)It is a 3.3V active-low signal.

PCIe_REQ0#: PCI Express Clock Request Input, active low signal. This signal shall be driven

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

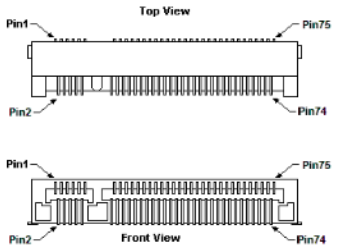
low by any module inserted in the connectivity slot, in order to ensure that the SoC makes available the reference clock.

CONFIG_1: Configuration input signal, +3.3V_S 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 CN20. When CONFIG_1 signal is high, then PCI-e x 2 interface is available on connector CN20. 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).

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

M.2 Connectivity Slot - CN19			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	+3.3V_A
3	USB_P4+	4	+3.3V_A
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	PCIe3_Tx+	36	---



It is possible to increase the connectivity of the UDOO X86 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 CN19, 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 X86 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.

PCIe3_TX+/PCIe3_TX-: PCI Express lane #3, Transmitting Output Differential pair

PCIe3_RX+/PCIe3_RX-: PCI Express lane #3, Receiving Input Differential pair

PCIe3_Clock+ / PCIe3_Clock-: PCI Express Reference Clock for lane #3, 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.

37	PCIe3_Tx-	38	---
39	GND	40	---
41	PCIe3_Rx+	42	---
43	PCIe3_Rx-	44	---
45	GND	46	---
47	PCIe3_CLK+	48	---
49	PCIe3_CLK-	50	SUS_CLK
51	GND	52	PLT_RST#
53	PCIe_REQ3#	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_A
73	---	74	+3.3V_A
75	GND		

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 CN20 slot and the connectivity modules plugged in CN19 slot). It is a 3.3V active-low signal.

PCIe_REQ3#: 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 X86 board to the module plugged in the slot CN17. +3.3V_A electrical level.

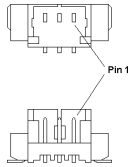
BT_DISABLE#: Bluetooth module disable, active low signal, +3.3V_A electrical level. This signal can be used to disable Bluetooth functionalities of any connectivity module plugged in CN16 Slot. This signal is also managed by UEFI BIOS (see par. 4.5, “Bluetooth on M.2”).

WIFI_DISABLE#; WiFi module disable, active low signal, +3.3V_A electrical level. This signal can be used to disable WiFi functionalities of any connectivity module plugged in CN16 Slot. This signal is also managed by UEFI BIOS (see par. 4.5, “WiFi on M.2”)

3.3.11 FAN connector

FAN Connector - CN22	
Pin	**Signal**
1	GND
2	FAN_POWER
3	FAN_TACHO_IN

Depending on the usage model of UDOO X86, for critical applications/environments on UDOO X86 it is available a 3-pin single line SMT connector for an external +12V_{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.

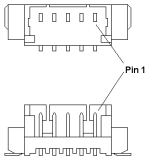
Please be aware that the use of an external fan depends strongly on customer’s application/installation.

FAN_POWER: +12V_A derived power rail for FAN.

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

3.3.12 UDOO Bricks connector

UDOO Bricks connector – CN24	
Pin	**Signal**
1	+3.3V_C
2	ALERT#
3	C_SDA0
4	C_SCL0
5	GND



This connector, managed by the Intel® Curie™ microcontroller, allows augmenting features offered by the UDOO X86 board, by adding the UDOO Bricks external sensor modules.

The connector used is type MOLEX p/n 53398-0571 or equivalent, with the pinout shown in the table on the left.

Mating connector: MOLEX 51021-0500 receptacle with MOLEX 50079-8000 female crimp terminals.

ALERT#: I2C Bus Alert. Input Signal, electrical level +3.3V_C. It is managed through the Intel® Curie™ Sensor Subsystem's GPIO #0

C_SDA0: I2C data line. Bidirectional signal, electrical level +3.3V_C with 10kΩ pull-up resistor. It is managed by the Intel® Curie™ Sensor Subsystem's I2C port #0

C_SCL0: I2C clock line. Bidirectional signal, electrical level +3.3V_A with 10kΩ pull-up resistor. It is managed by the Intel® Curie™ Sensor Subsystem's I2C port #0

3.3.13 SPI Header

SPI Header - CN16			
Pin	**Signal**	**Pin**	**Signal**
1	SPI_MISO	2	5V_C
3	SPI_CLK	4	SPI_MOSI
5	RESET	6	GND

This pin header, managed by the Intel® Curie™ microcontroller, has been implemented in order to allow the compatibility with existing Arduino sketches.

The connector, CN16 is an internal 10-pin standard right angle male pin header, p 2.54 mm, h= 6.1mm.

SPI_MISO: SPI Master In Slave Out input signal, electrical level +5V_C. It is managed through the Intel® Curie™ SPI master port #1

SPI_MOSI: SPI Master Out Slave In output signal, electrical level +5V_C. It is managed through the Intel® Curie™ SPI master port #1

SPI_CLK: SPI Clock output signal electrical level +5V_C. It is managed through the Intel® Curie™ SPI master port #1

RESET: Sketch reset input signal, electrical 5V_C

3.3.14 ARDUINO interface + expansion connectors

On four dedicated female headers p.2.54mm are realised both the Arduino 101 interface (managed by the Intel® Curie™ microcontroller) and the expansion interface, managed by the Intel® Braswell SoCs.

On the "internal" rows of these headers is implemented the Arduino interface, while on the "external" rows are available the expansion interfaces.

This will allow the plugging of Arduino 101-compatible sketches on these connectors, while leaving the further expansion interfaces free for use.

Arduino / Expansion Socket #1 - CN12			
Expansion side		Arduino 101 Side	
Pin	Signal	Pin	Signal
2	SPDIF_OUT	1	IO14_NEW
4	SDIO_CLK	3	+3.3V_C
6	SDIO_CMD	5	RST_SKETCH
8	SDIO_DAT0	7	+3.3V_C
10	SDIO_DAT1	9	+5V_C
12	SDIO_DAT2	11	GND
14	SDIO_DAT3	13	GND
16	SDIO_WAKE#	15	+12V_A

Arduino / Expansion Socket #3- CN14			
Expansion side		Arduino 101 Side	
Pin	Signal	Pin	Signal
2	TS_I2C_SDA	1	AD5_SCL
4	TS_I2C_SCL	3	AD5_SDA
6	TS_INT#	5	AD3
8	TS_RST#	7	AD2
10	I2C0_SDA	9	AD1
12	I2C0_SCL	11	AD0

Arduino / Expansion Socket #2 - CN13			
Arduino 101 side		Expansion Side	
Pin	Signal	Pin	Signal
19	AD5_SCL	20	1.8V_A
17	AD5_SDA	18	GND
15	---	16	PLT_RST#
13	GND	14	LPC_SERIRQ#
11	IO13/SCK	12	LPC_CLK
9	IO12/MISO	10	LPC_FRAME#
7	IO11/MOSI	8	LPC_AD3
5	IO10/SS	6	LPC_AD2
3	IO9/PWM3	4	LPC_AD1
1	IO8	2	LPC_AD0

Arduino / Expansion Socket #4 - CN15			
Arduino 101 side		Expansion Side	
Pin	Signal	Pin	Signal
15	IO7	16	UART2_RXD
13	IO6/PWM2	14	UART2_TXD
11	IO5/PWM1	12	UART2_CTS#
9	IO4	10	UART2_RTS#
7	IO3/PWM0	8	UART1_RXD
5	IO2	6	UART1_TXD
3	IO1/TXD	4	UART1_CTS#
1	IO0/RXD	2	UART1_RTS#

The Intel® Curie microcontroller is connected to the Intel® Braswell via an internal USB. It's exactly the same thing as having an Arduino 101 board attached via USB to a standard PC.

It is therefore possible refer to Arduino 101 documentation for a description of related signals, and the way to use them.

Here following the description of the "expansion" signals available on these connectors:

SPDIF_OUT: Realtek ALC283 S/PDIF Out signal, 12mA@75Ω driving capability.

SDIO_CLK: Intel® Braswell SD/MMC Port #2 Clock line, 1.8V_A electrical level output signal. To be used exclusively as a GPIO signal.

SDIO_CMD: Intel® Braswell SD/MMC Port #2 Command line, 1.8V_A electrical level bidirectional signal. To be used exclusively as a GPIO signal.

SDIO_DAT[0..3]: Intel® Braswell SD/MMC Port #2 Data bus. 1.8V_A electrical level bidirectional signals. To be used exclusively as GPIO signals.

SDIO_WAKE#: Wake capable input signal, 1.8V_A electrical level input.

TS_I2C_SDA: Touch-screen dedicated I2C Bus data line. Bidirectional signal, electrical level +1.8V_A. It is managed by Intel® Braswell SoCs' I2C port #5.

TS_I2C_SCL: Touch-screen dedicated I2C Bus clock line. Bidirectional signal, electrical level +1.8V_A. It is managed by Intel® Braswell SoCs' I2C port #5.

TS_INT#: +1.8V_A electrical level input. This signal can be used to serve the interrupt request of an eventual external Touch Screen connected to the dedicated I2C interface. It is also possible to use this signal as a GPIO.

TS_RST#: +1.8V_A electrical level output. This signal can be used to drive a reset of an eventual external Touch Screen connected to the dedicated I2C interface. It is also possible to use this signal as a GPIO.

I2C0_SDA: I2C Bus data line. Bidirectional signal, electrical level +1.8V_A. It is managed by Intel® Braswell SoCs' I2C port #0.

I2C0_SCL: I2C Bus clock line. Bidirectional signal, electrical level +1.8V_A. It is managed by Intel® Braswell SoCs' I2C port #0.

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 CN20 slot and the connectivity modules plugged in CN19 slot). 3.3V active-low output signal.

LPC_SERIRQ#: LPC Serialised IRQ request, bidirectional line, +3.3V_S electrical level. It is managed by Intel® Braswell SoCs' LPC bridge.

LPC_CLK: LPC Clock output, +3.3V_S electrical level 25MHz clock. It is managed by Intel® Braswell SoCs' LPC bridge.

LPC_FRAME#: LPC Frame indicator, active low output line, +3.3V_S electrical level. It is managed by Intel® Braswell SoCs' LPC bridge

LPC_AD[0..3]: LPC address, command and data bus, bidirectional signal, +3.3V_S electrical level. It is managed by Intel® Braswell SoCs' LPC bridge

UART2_RXD: UART Interface, Serial data Receive (input) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #2.

UART2_TXD: UART Interface, Serial data Transmit (output) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #2.

UART2_CTS#: UART Interface, Handshake signal, Clear to Send (Input) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #2.

UART2_RTS#: UART Interface, Handshake signal, Request to Send (output) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #2.

UART1_RXD: UART Interface, Serial data Receive (input) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #1.

UART1_TXD: UART Interface, Serial data Transmit (output) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #1.

UART1_CTS#: UART Interface, Handshake signal, Clear to Send (Input) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #1.

UART1_RTS#: UART Interface, Handshake signal, Request to Send (output) line, 1.8V_A electrical level. It is managed by Intel® Braswell SoCs' High Speed UART Controller #1.

3.3.15 IR Receiver

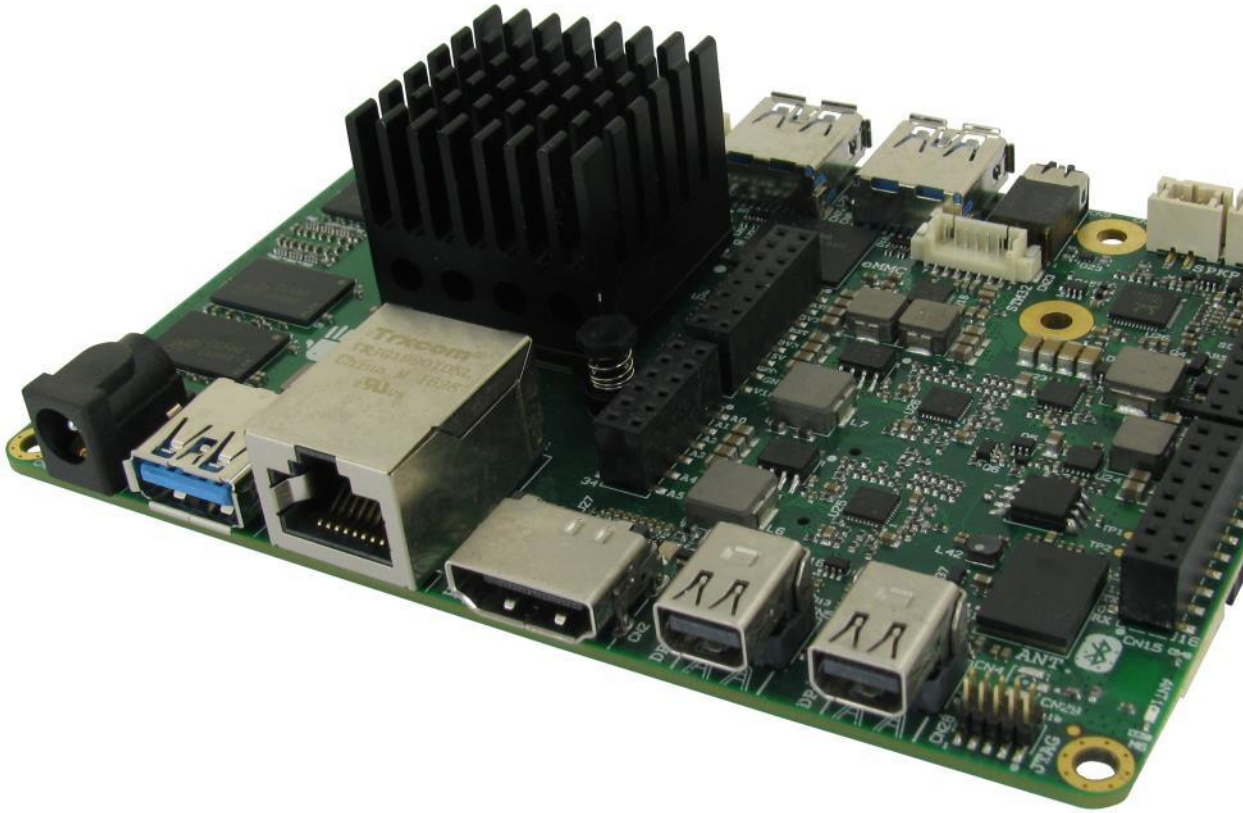
The UDOO X86 board embeds an IR receiver, which allows using a remote control when the board is placed in an enclosure (like, i.e., on Set Top Boxes).

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

The IR port is managed by the embedded microcontroller.

Chapter 4.
UEFI BIOS SETUP

- InsydeH2O setup Utility
- Main setup menu
- Advanced menu
- Security menu
- Power menu
- Boot menu
- Exit menu



4.1 InsydeH2O setup Utility

Basic setup of the board can be done using Insyde Software Corp. “InsydeH2O Setup Utility”, that is stored inside an onboard SPI Serial Flash.

It is possible to access to InsydeH2O 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
<F5> / <F6>	<F5> and <F6> keys allows to change the field value of highlighted menu item
<F1>	The <F1> key allows displaying the General Help screen.
<F9>	<F9> key allows loading Setup Defaults for the board. After pressing <F9> UEFI BIOS Setup utility will request for a confirmation, before saving and exiting. By pressing <ESC> key, this function will be aborted
<F10>	<F10> key allows save any changes made and exit Setup. After pressing <F10> key, UEFI 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, UEFI 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 display the setup sub-screens.

4.2 Main setup 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 UEFI 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
Boot Configuration	See submenu	Configures settings for Boot Phase
Security configuration	See submenu	Trusted Execution Environment Security Configurations
Video Configuration	See submenu	Configures the options for video section
Chipset Configuration	See submenu	Configure Chipset's parameters
ACPI Table / Features Control	See submenu	Configures the parameters for ACPI management
SATA Configuration	See submenu	Select the SATA controller and hard disk drive type installed in the system
Console Redirection	See submenu	Configures the parameters for Console redirection
POST Hot Key	See submenu	Configure POST Hot Keys
Other Configuration	See submenu	Other parameters settings

4.3.1 Boot configuration submenu

Menu Item	Options	Description
OS Selection	Windows / Android	Configures the UEFI BIOS in order to support properly Windows or Android OS.
Numlock	On / Off	Allows to choose whether NumLock Key at system boot must be turned On or Off

4.3.2 Security configuration (TXE) submenu

Menu Item	Options	Description
TXE HMRFP0	Disabled / Enabled	Enable this option to remove temporarily the flash protection, in order to program the Intel® TXE region
TXE Firmware update	Disabled / Enabled	Enable this option to require a re-flashing of TXE Firmware Image
TXE EOP Message	Disabled / Enabled	Send EOP (End of POST) Message before entering OS
TXE Unconfiguration Perform	Yes / No	Only selectable on CPUs with the TXE feature. Allows to revert TXE settings to the factory defaults
Measured boot	Disabled / Enabled	Enable or disable the measured boot, which provide to antimalware software a trusted log of all boot components that started before the antimalware software itself.

4.3.3 Video configuration submenu

Menu Item	Options	Description
HDMI	Disabled / Enabled	Enable / Disable the HDMI video port
Mini DisplayPort 1	Disabled / Enabled	Enable / Disable the miniDP video port #1 (CN5)
Mini DisplayPort 2	Disabled / Enabled	Enable / Disable the miniDP video port #2 (CN4)
Integrated Graphics Device	Disabled / Enabled	Enabled: enable Integrated Graphics Device (IGD) when selected as the Primary Video Adaptor. Disabled: always disable IGD. **Warning:** when the IGD is disabled, there will be no video output at all (unless there is an external PCIe graphic card selected as Primary Display) and restoring UEFI BIOS options to default values will be possible only by moving blindly in the setup menu.
Primary Display	Auto / IGD / PCIe	Select which between IGD or external PCI-e Graphic Controller should be the Primary display
RC6(Render Standby)	Disabled / Enabled	Permits to enable the render standby features, which allows the onboard graphics entering in standby mode to decrease power consumption
PAVC	Disabled / LITE Mode / SERPENT Mode	Allows enabling the hardware acceleration of decoding of Protected Audio Video streams. When not disabled, it is possible to choose between LITE encryption and SERPENT encryption modes.
PR3	Disabled / Enabled	Enable / Disable PAVP PR3 mode
Unsolicited Attack Override	Disabled / Enabled	Enable / Disable PAVP Unsolicited Attack Override
GTT Size	2MB / 4MB / 8MB	Select the GTT (Graphics Translation Table) Size
Aperture Size	128MB / 256MB / 512MB	Use this item to set the total size of Memory that must be left to the GFX Engine
IGD - DVMT Pre-Allocated	32M / 64M / 96M / 128M / 160M / 192M / 224M / 256M / 288M / 320M / 352M / 384M / 416M / 448M / 480M / 512M	Select DVMT5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphic Device
IGD - DVMT Total Gfx Mem	128M / 256M / MAX	Select the size of DVMT (Dynamic Video Memory) 5.0 that the Internal Graphics Device will use
IGD Turbo	Auto / Enabled / Disabled	Enable or Disable IGD Turbo mode
Power Meter Lock	Disabled / Enabled	Enable or disable the Power Meter lock Functionality
WOPCMSZ	1MB / 2MB / 4MB / 8MB	Select a size for WOPCM

4.3.4 Chipset configuration submenu

Menu Item	Options	Description
USB Configuration	See submenu	Configures USB Section
Audio Configuration	See submenu	Configures Audio Section
LPSS & SCC Configuration	See submenu	Configures LPSS (Low-Power Sub-System, i.e. DMA, PWM, UART and I2C interfaces) and SCC (Storage Control Cluster) devices
Miscellaneous Configuration	See submenu	Enable / Disable Misc. features
PCI Express Configuration	See submenu	PCI Express Configuration Settings

4.3.4.1 USB configuration submenu

Menu Item	Options	Description
USB BIOS Support	Disabled / Enabled / UEFI Only	Sets the support for USB keyboard / mouse / storage under UEFI and DOS environment. When set to UEFI only, then it will support exclusively UEFI environment.
xHCI Controller	Disabled / Enabled	Enable/Disable the xHCI Controller PreBoot Support
Port#0 (USB3.0 Front Panel CN6)	Disabled / Enabled	Enable / Disable USB Port #0, which is available on USB 3.0 connector CN6 in Front Panel Side
Port#1 (USB3.0 Front Panel CN7)	Disabled / Enabled	Enable / Disable USB Port #1, which is available on USB 3.0 connector CN7 in Front Panel Side
Port#2 (USB3.0 Rear Panel CN8)	Disabled / Enabled	Enable / Disable USB Port #2, which is available on USB 3.0 connector CN8 in Rear Panel Side
Port#3 (Arduino 101)	Disabled / Enabled	Enable / Disable USB Port #3, which is used for the communications with Intel® Curie™ microcontroller implementing the Arduino 101 interface
Port#4 (USB2.0 M.2 Type 2230 CN19)	Disabled / Enabled	Enable / Disable USB Port #4, which is available on M.2 Connectivity Slot CN19

4.3.4.2 Audio configuration submenu

Menu Item	Options	Description
Audio Controller	Disabled / Enabled	Controls the detection of the HD Audio Controller Disabled: the Audio controller will be unconditionally Disabled Enabled: the Audio controller will be unconditionally Enabled
Azalia HDMI Codec	Disabled / Enabled	Enable or Disable internal HDMI Codec for audio
Mute HDA Amplifier	Disabled / Enabled	Force the HDA amplifier to mute, when enabled.

4.3.4.3 LPSS & SCC configuration submenu

Menu Item	Options	Description
Hide unused LPSS devices	Enable / Disable	Hide Unused LPSS & SCC ACPI Devices.
LPSS & SCC Auto Switch	Enable / Disable	Auto switches LPSS and SCC devices from ACPI mode to PCI mode when the OS doesn't support ACPI mode.
ACPI GPIO Devices Support	Enabled (ACPI) / Disabled	Enable or Disable GPIO ACPI Devices Support
eMMC Support	Disabled / Enabled (PCI) / Enabled (ACPI)	Disable the eMMC Support, or enables it in PCI or ACPI Mode.
SD Card Support	Disabled / Enabled (PCI) / Enabled (ACPI)	Disable the SD Card Support, or enables it in PCI or ACPI Mode.
DMA #1 Support	Disabled / Enabled (PCI) / Enabled (ACPI)	Allows to enable first DMA Channel, which onboard is used to support the UART interfaces
HSUART #1	Disabled / Enabled	Can be changed only when "DMA #1 Support" is not Disabled. Enable / Disable the UART interface #1 available on connector CN15
HSUART #2	Disabled / Enabled	Can be changed only when "DMA #1 Support" is not Disabled. Enable / Disable the UART interface #2 available on connector CN15
DMA #2 Support	Disabled / Enabled (PCI) / Enabled (ACPI)	Allows to enable second DMA Channel, which on-board is used to support the I2C Channels
I2C #0 - CN14 pin 10/12	Disabled / Enabled	Can be changed only when "DMA #2 Support" is not Disabled. Enable / Disable the I2C port #0 available on connector CN14, pins 10/12
I2C #5 - CN14 pin 2/4	Disabled / Enabled	Can be changed only when "DMA #2 Support" is not Disabled. Enable / Disable the I2C port #5 available on connector CN14, pins 2/4

4.3.4.4 Miscellaneous Configuration submenu

Menu Item	Options	Description
RTC Lock	Enabled / Disabled	When Enabled, bytes 38h-3F8h in the lower/upper 128-byte bank of RTC RAM will be locked.
BIOS Lock	Enabled / Disabled	Enable or disable UEFI BIOS SPI region write protect.
LPC Support	Enabled / Disabled	Enable or disable the LPC support on connector CN13 (pins 2 / 4 / 6 / 8 / 10 / 12 / 14). When disabled, the LPC dedicated pins will be available as GPIOs
Serial IRQ	Enabled / Disabled	Available only when "LPC Support" is enabled. Enable / Disable the Serial IRQ
Serial IRQ Mode	Quiet Mode Continuous Mode	Available only when "LPC Support" and "Serial IRQ" are enabled. Select Serial IRQ Mode. In continuous mode, the host will continually check for device interrupts. In Quiet Mode, Host will wait for a SERIRQ slave to generate a request by driving the SERIRQ line low.

4.3.4.5 PCI Express configuration submenu

Menu Item	Options	Description
PCI Express Port x2 - M.2 on CN20 x2 slot PCI Express Port x1 - Internal LAN PCI Express Port 3 - M.2 Slot CN19	See submenu	

4.3.4.5.1 PCI Express Root Port #x configuration submenus

Menu Item	Options	Description
PCI Express Root Port #1 PCI Express Root Port #3 PCI Express Root Port #4	Disabled / Enabled	Enable or Disable single PCI Express Root Port #x. PCI Express Root Port #3 is internally connected to the Gigabit Ethernet Controller. Disabling this port will result in disabling the corresponding Ethernet interface.
PCIe Speed	Auto / Gen1 / Gen2	Set PCI-e ports link speed/capability.

4.3.5 ACPI Table/features submenu

Menu Item	Options	Description
FACP - RTC S4 wakeup	Enabled / Disabled	Enable or disable FACP (Fixed ACPI Description Table) support for S4 wakeup from RTC
FACP - Preferred PM Profile	Auto / Desktop / Mobile	This Option sets the preferred power management profile in ACPI Fixed ACPI Description Table
DSDT - ACPI S3 Support	Enabled / Disabled	Enable or disable DSDT (Differentiated System Description Table) support for ACPI S3 State
DSDT - ACPI S4 Support	Enabled / Disabled	Enable or disable DSDT (Differentiated System Description Table) support for ACPI S4 State
WDAT/WDRT - TCO Watchdog Support	Enabled / Disabled	Enable or disable the TCO Watchdog Support

4.3.6 SATA configuration submenu

Menu Item	Options	Description
SATA Controller	Enabled / Disabled	Disabled: Disables SATA Controller. All following items will be disabled Enabled: Enables SATA Controller
SATA Interface Speed	Gen1 / Gen2 / Gen3	Select SATA speed
SATA Port 0 / SATA Port 1	Enabled / Disabled	Enables or disable SATA Port #0 (M.2 Slot CN17) / SATA Port #1 (SATA Connector CN18).
Serial ATA Port 0 / 1		Shows information related to eventual devices connected to SATA ports 0 or 1

4.3.7 Console Redirection submenu

Menu Item	Options	Description
Console Serial Redirect	Enabled / Disabled	Enable or disable Console redirection. When enabled, all the following menu items will appear
Terminal Type	VT_100 / VT_100+ / VT_UTF8 / PC_ANSI	Set Console Redirection terminal type
Baud rate	115200 / 57600 / 38400 / 19200 / 9600 / 4800 / 2400 / 1200	Set Console Redirection baud rate
Data Bits	7 bits / 8 bits	Set Console Redirection data bits
Parity	None / Even / Odd	Set Console Redirection parity bits
Stop Bits	1 bit / 2 bits	Set Console Redirection stop bits
Flow Control	None RTS/CTS XON/XOFF	Set Console Redirection flow control type
Information Wait Time	0 Seconds / 2 Seconds / 5 Seconds / 10 Seconds / 30 Seconds	Set Console Redirection port information display time
C.R. After Post	Yes / No	Console Redirection continues to work even after Bios POST.
AutoRefresh	Enabled / Disabled	When this feature is enabled, the screen will auto refresh once after detecting the connection of a remote terminal
FailSafeBaudRate	Enabled / Disabled	This feature will auto detect remote terminal baud rate and connect C.R serial device with detected baud rate
ACPI SPCR Table	Enabled / Disabled	Serial Port Console Redirection Table. When this feature is enabled, the SPCR table will be add-into ACPI tables.
PCI_HS_UART 0:30:3 PCI_HS_UART 0:30:4	See submenus	

4.3.7.1 PCI HS_UART 0:30:x submenus

Menu Item	Options	Description
Port Enabled	Disabled / Enabled	Enable or Disable single PCI HS_UART Port #x.
UseGlobalSetting	Disabled / Enabled	When this item is enabled, the corresponding HS_UART will use the global settings. Otherwise, it will be possible to set individually the following items
Terminal Type	VT_100 / VT_100+ / VT_UTF8 / PC_ANSI	Set HS_UART #x terminal type
Baud rate	115200 / 57600 / 38400 / 19200 / 9600 / 4800 / 2400 / 1200	Set HS_UART #x baud rate
Data Bits	7 bits / 8 bits	Set HS_UART #x data bits
Parity	None / Even / Odd	Set HS_UART #x parity bits
Stop Bits	1 bit / 2 bits	Set HS_UART #x stop bits
Flow Control	None RTS/CTS XON/XOFF	Set HS_UART #x flow control type

4.3.8 POST Hot Key submenu

Menu Item	Options	Description
Device Manager Hot Key	N/A / F1 / F2 / F3 / F4 / F5 / F6 / F7 / F8 / F9 / F10 / F11 / F12 / DEL / ESC	Allows assigning an Hot key to enter the Device Manager utility during POST phase
Setup Utility Hot Key	N/A / F1 / F2 / F3 / F4 / F5 / F6 / F7 / F8 / F9 / F10 / F11 / F12 / DEL / ESC	Allows assigning an Hot key to enter the Setup utility during POST phase
Boot Manager Hot Key	N/A / F1 / F2 / F3 / F4 / F5 / F6 / F7 / F8 / F9 / F10 / F11 / F12 / DEL / ESC	Allows assigning an Hot key to enter the Boot Manager utility during POST phase
Boot From File Hot Key	N/A / F1 / F2 / F3 / F4 / F5 / F6 / F7 / F8 / F9 / F10 / F11 / F12 / DEL / ESC	Allows assigning an Hot key to enter the Boot From File utility during POST phase
Front Page Hot Key	N/A / F1 / F2 / F3 / F4 / F5 / F6 / F7 / F8 / F9 / F10 / F11 / F12 / DEL / ESC	Allows assigning an Hot key to enter the Front Page Screen during POST phase

4.3.9 Other configuration submenu

Menu Item	Options	Description
Win7 Keyboard/Mouse Support	Enabled / Disabled	Enable or disable the support for USB Keyboard and Mouse in Windows 7 even in absence of the xHCI driver.
Force Legacy Free	Enabled / Disabled	When enabled, this item will force the Legacy Free mode (it will disable the KBC).

4.4 Security menu

Menu Item	Options	Description
TPM Availability	Available / Hidden	When this item is set to Hidden, the TPM will not be shown to the OS
TPM Operation	No operation Disabled Enabled	Enable or Disable Storage Hierarchy and Endorsement Hierarchy
Clear TPM	Yes / No	Clear TPM. Removes all TPM context associated with a specific Owner.
Set Supervisor Password		Install or Change the password for supervisor. Length of password must be greater than one character.
Power on Password	Enabled / Disabled	Available only when Supervisor Password has been set. Enabled: System will ask to input a password during P.O.S.T. phase. Disabled: system will ask to input a password only for entering Setup utility
User Access Level	View Only Full	Available only when Supervisor Password has been set. View Only: User can view SETUP menu items but cannot change any item. Full: User has full access to SETUP menu and can change all items, except the Supervisor Password
Set User Password		Install or Change the password for User. Length of password must be greater than one character.
Clear User Password		Selecting this option will clear the User password without having to type the current password. A supervisor can use this to clear a user password without knowing it.

4.5 Power menu

Menu Item	Options	Description
Advanced CPU Control	See submenu	These items control various CPU parameters
EC Watchdog Configuration	See submenu	Embedded Controller Watchdog Configuration Settings
Thermal Zone configuration	See submenu	Thermal Zone Configuration: Active and Passive Cooling Settings.
Power Fail Resume Type	Always ON Always OFF Last State	Determine the System Behavior after a power failure event. In case the option is “Always ON”, the board will start every time the power supply is present. When the option is “Always OFF”, the board will not start automatically when the power supply returns. Finally, if this option is set to “Last State”, the board will remember the state it had when the power supply went down: so, if the board was on, it will start again when the power returns, and will remain off if the board was in this state when the power went down. A CMOS Battery is required to support this feature, otherwise the chipset default setting is Always ON.
WiFi on M.2	Enabled / Disabled	Enables or disables the WiFi capabilities of WiFi cards plugged into M.2 slot CN19.
Bluetooth on M.2	Enabled / Disabled	Enables or disables the BT capabilities of BlueTooth cards plugged into M.2 slot CN19.
Instant OFF	Enabled / Disabled	In non-ACPI environments, this item will enable the system shut-down by a power button pressure.
Power on Intel Curie	Enabled / Disabled	If enabled, it will power-on the Arduino interface
Curie Power Management	Enabled Wake Only Disabled	Enables or disables the system power-on and power-off managed by the Intel® Curie™ via IO9/PWM3 signal (CN13 pin 3, active low 20ms pulse). When disabled, the Intel® Curie™ will never be able to change the power status of the system. When “Wake Only”, the Intel® Curie™ will only be able to wake the system from S3/S4/S5 When enabled, the Intel® Curie™ will be able both to put the system in a low power state (S3/S4/S5, depending on OS configuration) and wake from it
Curie reset on Power On	Enabled / Disabled	When enabled, the system will automatically reset the Intel® Curie™ when the system wakes from a low-power state (S3/S4/S5)
Infrared Support	Enabled Wake Only Disabled	Enables or disables the system power-on and power-off managed by the Infrared Remote Control. When disabled, the Infrared Receiver will be unconditionally disabled. When “Wake Only”, the Infrared Receiver will only be able to wake the system from S3/S4/S5 When enabled, the Infrared Receiver will be able both to put the system in a low power state (S3/S4/S5, depending on OS configuration) and wake from it
Wake on PME	Enabled / Disabled	Determines whether the system must wake up or not when the system power is off and occurs a PCI Power Management Enable wake-up event (e.g. to enable Wake on LAN feature).

Wake on RTC from S5	Disabled By Every Day By Day of Month By Sleep Time By OS Utility	Auto wake up from S5 state, it can be set to happen “By Every Day”, “By Day of Month”, “By Sleep Time” or “By OS Utility”.
Wake from S5 time	[hh:mm:ss]	This menu item is available only when “ Wake on RTC from S5” is set to “By Every Day” of “By Day of Month”. Set time of the day when the board must wake up automatically
Day of month	1 ÷ 31	This menu item is available only when “Auto Wake on S5” is set to “By Day of Month” This is the help for the day field. Valid range is from 1 to 31. Error checking will be done against month/day/year combinations that are not supported. Use + / - to Increase / reduce
Wake from S5 after (seconds)	5 ÷ 44	This menu item is available only when “Auto Wake on S5” is set to “By Sleep Time” Set the number of seconds after which the board will wake up automatically

4.5.1 Advanced CPU control submenu

Menu Item	Options	Description
Use XD Capability	Enabled / Disabled	Enable or disable processor XD (Execute Disable) capability, it allows to enable or disable the hardware feature needed for data execution prevention
Limit CPUID Max Value	Enabled / Disabled	Set this option to enabled for use with older O.S. that are not able to manage the CPUID value higher than 03h, which was typical for Intel® Pentium 4 with Hyper Threading Technology Leave disabled for newer O.S. able to manage actual CPUID value.
Bi-Directional PROCHOT#	Enabled / Disabled	PROCHOT# is the signal used to start thermal throttling. This signal can be driven by any processor cores' to signal that the processor will begin thermal throttling. If bi-directional signaling is enabled, then external components can also drive PROCHOT# signal in order to start throttling.
VTX-2	Enabled / Disabled	Enable or Disable Intel® Virtualization Technology, allowing hardware-assisted virtual machine management.
TM1	Enabled / Disabled	Enable or Disable TM1 Thermal management modes.
Active Processor Cores	1 / 2 / ALL	Number of cores to enable in each processor package. 1 means that multicore processing is disabled.
P-States (IST)	Enabled / Disabled	Enable or disable processor management of performance states (P-states)
Boot Performance Mode	Max Performance Max Battery Auto	Only available when P-states are enabled Allows to select which performance state must be set by UEFI BIOS before starting OS loading.
Turbo Mode	Enabled / Disabled	Only available when P-states are enabled Enable processor Turbo Mode
C-States	Enabled / Disabled	Enable processor idle power saving states (C-States).
Enhanced C-States	Enabled / Disabled	Enable P-state transition to occur in combination with C-states.
Max C-States	C1 / C6 / C7	Only available when C-states are enabled Allows selection of the maximum C-State that must be supported by the OS.

4.5.2 EC Watchdog Configuration submenu

Menu Item	Options	Description
Watchdog	Enabled / Disabled	Enable or Disable the Watchdog
Watchdog Action	System reset Power Button 1s Power Button 4s (shutdown)	This submenu is available only when “Watchdog” is set to Enabled. Specifies the action that must be performed when Watchdog timeout occurs. With System Reset, the module will reset itself With “Power Button 1s”, the system will simulate the pressure for 1 sec. of Power button, which will lead the O.S. to close all his tasks then shutdown. With “Power Button 1s”, the system will simulate the pressure for 1 sec. of Power button, which will lead to the immediate shutdown of the module
Delay to start (sec.)	0 ÷ 600	This item can be changed only when “Watchdog” is enabled. Seconds of delay before the watchdog timer starts counting
Timeout (sec.)	20 ÷ 600	This item can be changed only when “Watchdog” is enabled. Watchdog Timeout.

4.5.3 Thermal Zone configuration submenu

Menu Item	Options	Description
Critical temperature (°C)	Disabled / 80 / 85 / 88 / 90	Above this temperature value, an ACPI aware OS performs a critical shutdown.
Hot temperature (°C)	Disabled / 80 / 85 / 88 / 90	Above this temperature value, an ACPI aware OS hibernates the system.
Passive Cooling temperature (°C)	Disabled / 70 / 75 / 80 / 85	Above this threshold, an ACPI aware OS will start to lower the CPU frequency.
AC0 Temperature (°C)	Disabled / 65 / 70 / 75 / 80 / 85 / Always On	Select the highest temperature above which the onboard fan must work always at Full Speed. With Always On the Fan will work always at Full Speed, temperature will be considered always over the threshold.
AC1 Temperature (°C)	Disabled / 55 / 60 / 65 / 70 / 75 / 80 / 85 / 90 / 95 / 100 / 105 / 110 / 115 / Always On	Select the lowest temperature under which the onboard fan must be OFF. With Always On the Fan will work always at Full Speed, ignoring AC1 threshold
FAN Duty Cycle (%) Above AC1	50 / 75 / 100	Use this item to set the Duty Cycle for the fan when the CPU temperature is between AC1 and AC0 threshold. Above AC0, the fan will run at full speed.

4.6 Boot menu

Menu Item	Options	Description
Boot type	Dual boot Type Legacy Boot Type UEFI Boot Type	Allows to select if the OS must be booted using Legacy Boot Mode, UEFI Boot mode or indifferently using both modalities (depending on the OS)
Quick Boot	Enabled / Disabled	Skip certain tests while booting. This will decrease the time needed to boot the system.
Quiet Boot	Enabled / Disabled	Disables or enables booting in Text Mode.
Display Boot Logo	Enabled / Disabled	Enable or display the visualization of a logo during Boot phase
Logo persistence Time (s)	0 ÷ 10	This submenu is available only when “Display Boot Logo” is set to Enabled. Forced wait time in seconds during the boot logo visualization. 0 means boot as fast as possible. Even with 0 wait time. UEFI OSes supporting BGRT table will display the logo while booting.
Display ESC Key Strings	Enabled / Disabled	Display or Hide the “ESC key” strings during the UEFI BIOS boot. Disabling this configuration, no information on how to enter Setup Configuration Utility will be displayed.
Network Stack	Enabled / Disabled	This submenu is available only when “Boot Type” is set to “UEFI Boot type” or “Dual Boot type”. When enabled, this option will make available the following Network Stack services: Window 8 BitLocker Unlock UEFI IPv4 / IPv6 PXE Legacy PXE OpROM
PXE Boot Capability	Disabled UEFI : IPv4 UEFI : IPv6 UEFI : IPv4/IPv6 Legacy	This submenu is available only when “Network Stack” is Enabled Specifies the PXE (Preboot Execution Environment) Boot possibilities. When Disabled, Network Stack is supported For UEFI, it supports IPv4, IPv6 or both In Legacy mode, only Legacy PXE OpROM is supported
PXE Boot to LAN	Enabled / Disabled	This submenu is available only when “Boot Type” is set to “Legacy Boot type”. Disables or enables the possibility for the PXE to perform the boot from LAN.
Power Up in Standby Support	Enabled / Disabled	Disable or enable Power Up in Standby Support. The PUIS feature set allows devices to be powered-up in the Standby power management state to minimize inrush current at power-up and to allow the host to sequence the spin-up of devices.
Add Boot options	First / Last / Auto	Specifies the position in Boot Order for Shell, Network and Removable Disks

ACPI selection	Acpi1.0B / Acpi3.0 / Acpi4.0 / Acpi5.0	Using this menu item is possible to select to which specifications release the ACPI tables must be compliant.
USB Boot	Enabled / Disabled	Disables or enables booting from USB boot devices.
EFI/Legacy Device Order	EFI device first Legacy device first Smart Mode	This submenu is available only when “Boot Type” is set to Dual Boot Type. Determine if boot must happen first through EFI devices or through legacy devices, or in Smart Mode.
UEFI OS Fast Boot	Enabled / Disabled	This submenu is available only when “Boot Type” is set to UEFI Boot Type. If enabled, the system firmware does not initialize keyboard and check for firmware menu key.
USB Hot Key Support	Enabled / Disabled	Available only when “Boot Type” is set to UEFI Boot Type and “UEFI OS Fast Boot” is Enabled. Enable or disable the support for USB HotKeys while booting. This will decrease the time needed to boot the system
Timeout	0 ÷ 10	The number of seconds that the firmware will wait before booting the original default boot selection.
Automatic Failover	Enabled / Disabled	When this item is enabled, if boot from the default device fails, then the system will attempt directly to boot from the next device on the Boot devices list When this item is disabled, in case of failure from booting from the first boot device, then a Warning Message will pop up and subsequently enter into Firmware UI.
EFI	See Submenu	This submenu is available only when “Boot Type” is not set to “Legacy Boot type”. The submenu will show a list of EFI boot devices. Use F5 and F6 key to change order for boot priority.
Legacy	See Submenu	This submenu is available only when “Boot Type” is not set to “UEFI Boot type”. Allows setting of Legacy Boot Order

4.6.1 Legacy submenu

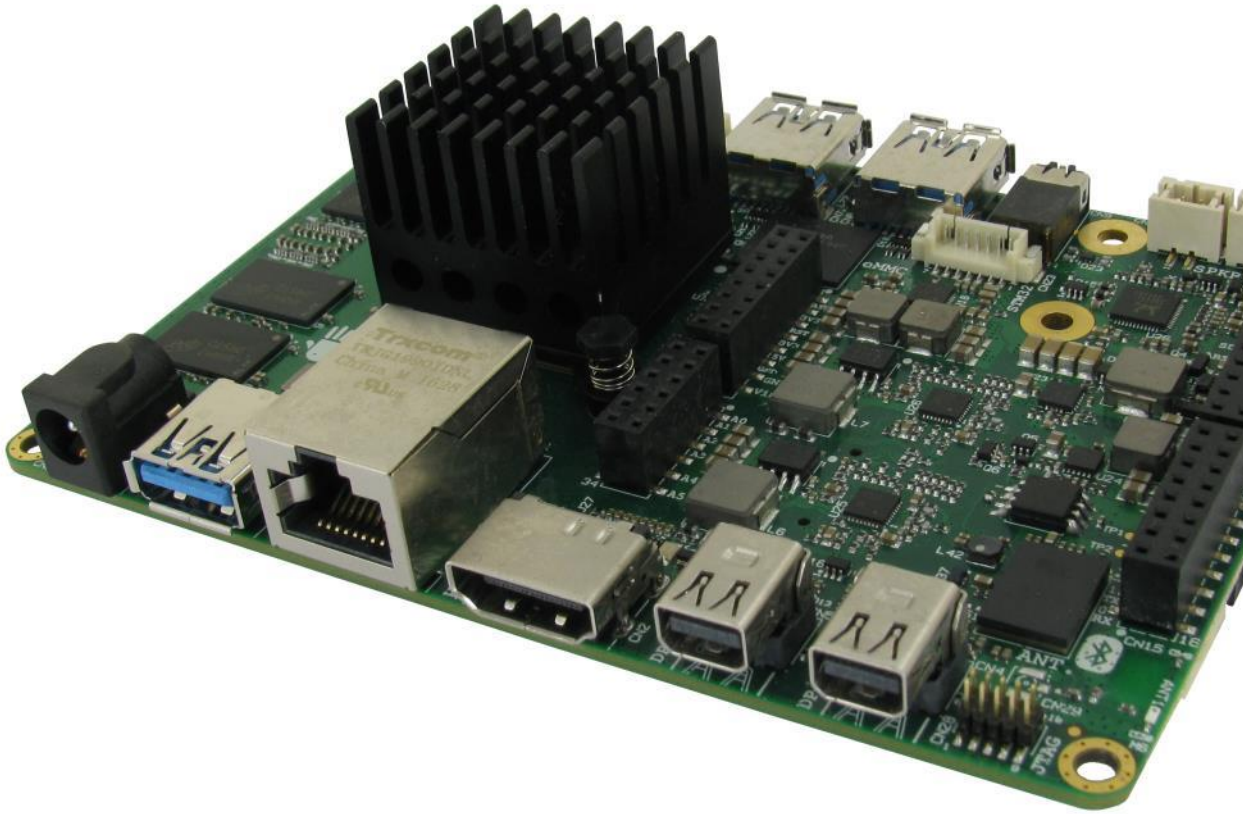
Menu Item	Options	Description
Boot Menu	Normal / Advance	When set to Normal, this submenu will allow configuring all possible options for Legacy boot. When set to Advance, it will be possible to configure Boot Order only for bootable devices found in the system
Boot Type Order	Floppy Drive / Hard Disk Drive CD/DVD-ROM Drive / USB / Other	This voice will be selectable only when “Boot menu” is set to “Normal”. The list shown under this item will allows selecting the boot from different devices. Use the + and - Keys to change the boot order priority
Hard Disk Drive	*List of HD Drives found connected*	This voice will be selectable only when “Boot menu” is set to “Normal”. The list shown under this item will show different Disk drives found connected to the module, therefore changing the boot priority for them. Use the + and - Keys to change the boot order priority
USB	*List of USB Disks found connected*	This voice will be selectable only when “Boot menu” is set to “Normal”. The list shown under this item will show different USB disks found connected to the module, therefore changing the boot priority for them. Use the + and - Keys to change the boot order priority

4.7 Exit menu

Menu Item	Options	Description
Exit Saving Changes		Exit system setup after saving the changes. F10 key can be used for this operation.
Save Change Without Exit		Save all changes made, but doesn't exit from setup utility.
Exit Discarding Changes		Exit system setup without saving any changes. ESC key can be used for this operation.
Load Optimal Defaults		Load Optimal Default values for all the setup items. F9 key can be used for this operation.
Load Custom Defaults		Load Custom Default values for all the setup items.
Save Custom Defaults		Save Custom Default values for all the setup items.
Discard Changes		Discard Changes but doesn't exit from setup utility.

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 X86 board (through M.2 Slot CN20), 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 CN20, the UDOO X86 board will offer three different Gigabit Ethernet ports.

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