



USER MANUAL



UDOO VISION

Next-gen Open hardware SBC picolTX with Intel®
Apollo Lake family of SoCs



www.udoo.org

REVISION HISTORY

Revision	Date	Note	Ref
1.0	15 th June 2021	First Official Release.	AR

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Some of the information found in the UEFI BIOS SETUP Chapter has been extracted from the following copyrighted Insyde Software Corp. documents:

- InsydeH2O™ Setup Utility - User Reference Guide

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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
- Labels
- FCC certification
- Terminology and definitions
- Reference specifications



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).



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1.4 Safety

The UDOO VISION 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 VISION 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 and FCC certification retained using only the UDOO VISION qualified Power Supply Unit. When not using UDOO VISION qualified Power Supply, use 12VDC (min 36W power) PSUs certified for your country (make sure that the power cable is less than 3 mt. long).

UDOO VISION qualified PSU: XYZ-120300U. Input: 100-240VAC 50/60Hz. Output: 12V_{DC} 3A 48W_{Max}

CE and FCC certifications retained with the board equipped with the UDOO VISION metal case. When not available, it is suggested to use a case with the same attributes as the UDOO VISION metal Case, sold as an accessory (P/N: KTMC-D02-COV01.00).

1.5 Electrostatic discharges

The UDOO VISION 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 VISION board, ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended. During normal work condition of UDOO VISION board, do not touch the product.



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1.6 RoHS compliance

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

1.7 Labels



The parts highlighted in red (the QR Code and the Serial Number) will change for every Board.

The S/N is divided in:

YY= Year of Manufacturing.

MM= Month of Manufacturing.

XXXXX= Monthly Progressive Number

In addition, since the UDOO VISION system is susceptible to electrostatic discharges, the right label is included in the package and must be applied in the final end-user external metal case, to indicate that UDOO VISION includes static sensitive components and do not have to be touched during normal working mode condition.



UDOO VISION System does not include the metal case, that will be sold as a separate accessory. For this reason, the UDOO VISION system will include the labels in a separate package shipped by Seco S.p.A. These labels must be properly applied by the customer in the final end-user external metal case.

1.8 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.

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
DP++	Multimode Display Port, a video interface which can support both Display Port displays (directly) and HDMI/DVI displays (by using an external adapter)
eDP	embedded Display Port, a type of digital video display interface developed especially for internal connections between boards and digital displays
EHCI	Enhanced Host Controller interface, a high-speed controller for USB ports, able to support USB2.0 standard
FFC/FPC	Flexible Flat Cable / Flat Panel Cable
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
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
LPDDR4	Low-Power Double Data Rate Synchronous Dynamic Random Access Memory, 4th generation
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
OTG	On-the-Go, a specification that allows to USB devices to act indifferently as Host or as a Client, depending on the device connected to the port.
PCI-e	Peripheral Component Interface Express
PHY	Abbreviation of Physical, it is the device implementing the Physical Layer of ISO/OSI-7 model for communication systems
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
SDHC	Secure Digital Host Controller
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
UIM	User Identity Module, an extension of SIM modules.
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
DP, eDP	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
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://pcsig.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® Atom™ Apollo Lake family	https://ark.intel.com/content/www/us/en/ark/products/codename/80644/apollo-lake.html#@Embedded

Chapter 2. OVERVIEW

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



2.1 Introduction

UDOO VISION is a system designed specifically for maker's / DIY market, made by a Single Board Computer in pico-ITX form factor (just 100 x 72mm), embedding both a System-on-Chips (SoC) of the Intel® family of embedded SoCs formerly coded as Apollo Lake, and an Arduino™ Leonardo compatible platform.

The UDOO VISION Single Board Computer is equipped with an active heatsink with FAN to prevent system hang-off or faults.

The UDOO VISION board represents a junction point between the PC world, represented by the Apollo Lake SoCs, and the Arduino™ Leonardo World, implemented on-board using an Atmel ATmega32u4 microcontroller.

All the possible SoCs mounted on UDOO VISION are Quad Core Intel® Atom™ E39XX CPUs with 1.6 GHz base frequency and with 64-bit instruction set and very low TDP. This single chip solution includes the memory controller, which gives support for up 32-bit Quad-Channel LPDDR4 2400 MT/s Memory.

All SOC's embed an Integrated Intel® HD Graphics 500 series controller with up to 18 Execution Units, which offer high graphical performances, with support for Microsoft® DirectX12, OpenGL 4.3, OpenCL 1.2, OpenGLES 3.0 and HW acceleration for video encoding and decoding of HEVC (H.265), H.264, JPEG/MJPEG. It is also possible the HW video decoding only of VP9, MPEG2, VC-1 and WMV9. This embedded GPU is able to drive two independent displays, by using the eDP and the miniDP++ connectors. Any combinations of these video interfaces are supported.

Mass Storage capabilities of the UDOO VISION board include two external S-ATA Gen3 channels (one available on a standard SATA 7p Male connector, the other on an M.2 Socket 2 Key B Slot), a standard 4-bit SD interface and one optional eMMC Drive soldered on board.

Further features usable on UDOO VISION board are WWAN M.2 Socket 2 Key B Slot connected to a miniSIM slot for modems, seven USB ports (two USB 3.0 on standard Type-A socket, two USB 2.0 on dual internal pin header, one USB 2.0 on M.2 Socket 1 Key E Connectivity slot, one USB 3.0 on M.2 Key B slot and another USB 2.0 port used for the communications with the Atmel microcontroller), HD Audio and three PCI Express lanes, (two PCI express lanes are used for the implementation of the Gigabit Ethernet interfaces, one lane is carried out on M.2 Socket 1 Key E Connectivity Slot) up to 2x Gigabit Ethernet connections, one M.2 Socket 1 Key E Slot for WiFi+BT M.2 modules.

Through the Intel® Apollo Lake SoC's USB interface #6 pass all the communications with the Atmel 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 VISION the most powerful maker system ever.

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



2.2 Technical specifications

SOC

8th generation Intel® Atom™ family of SOCs:

Intel® Atom™ x7-E3950, Quad Core @1.6GHz, 2MB L2 Cache, 12W TDP

Intel® Atom™ x5-E3940, Quad Core @1.6GHz, 2MB L2 Cache, 9.5W TDP

Memory

Up to 8GB 32-bit Quad-Channel LPDDR4 soldered on-board, up to 2400 MT/s

Graphics

Integrated Intel® HD Graphics 500 series controller

Two independent displays support

HW decoding of HEVC(H.265), H.264, MVC, VP8, VP9, MPEG2, VC-1, WMV9, JPEG/MJPEG formats

HW encoding of HEVC(H.265), H.264, MVC, VP8, VP9 and JPEG/MPEG formats

Video Interfaces

eDP connector

miniDP++ connectors

Video Resolution

eDP, resolution up to 3840 x 2160 @60Hz

DP++, resolution up to 4096x2160 @ 60Hz

Mass Storage

Optional eMMC drive onboard, up to 64GB

SATA Gen3 7p M connector

M.2 Key B SSD slot (Type 2242/3042/2280 modules accepted)

microSD Card slot (combo with miniSIM slot)

Networking

2x Gigabit Ethernet LAN ports, using Intel® I21x family Gigabit Ethernet controllers

M.2 Key B WWAN Slot (Type 2260/3042 modules accepted)

M.2 Connectivity Slot (Socket 1 Key E type 2230) for plugging WiFi+BT modules

USB

2 x USB 3.0 ports on Dual Type-A socket

1 x USB 3.0 port on M.2 Key B slot

2 x USB 2.0 host ports on internal dual pin header

1 x USB 2.0 port available on M.2 Key E Slot

PCI-Express

2 x PCI-e x1 port on Gigabit Ethernet Controllers

1 x PCI-e x1 port on M.2 Key E Slot

Audio

HD Audio Codec Cirrus Logic CS4207

Combo TRSS connector with Mic In and Line out support

Serial ports

2 x RS-232/RS-422/RS-485 Serial ports on internal pin header

Other Interfaces

miniSIM slot for M.2 modems (combo with microSD slot)

8 x GPIOs connector

Tachometric FAN connector

Switch/LED Front Panel Header

Arduino™ Leonardo compatible interface

Power supply: +12V_{DC} ± 5%

Cabled coin cell battery for RTC

SATA 4p M power connector

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

Dimensions: picolTX form factor 72x100 mm (2.83" x 3.93").

Supported Operating Systems:

Microsoft® Windows 10 Enterprise (64-bit)

Microsoft® Windows 10 IoT Core (32- /64-bit)

WindRiver Linux 64-bit

Yocto (64-bit)



** Environmental temperature, measured using UDOO VISION Standard heatsink

2.3 Electrical specifications

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

This voltage can be supplied through a standard 5.7mm (internal pin, diameter 2.0 mm) Power Jack (CN2).

Internal pin is V_{IN} power line.

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 CR2032S-LD Lithium coin-cell battery, with a nominal capacity of 220mAh.

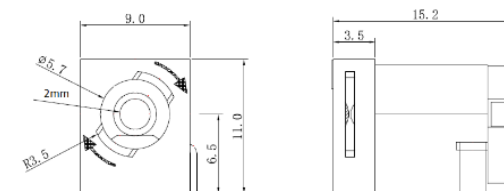
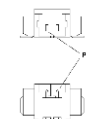
Battery connector – CN3

Pin	Signal
1	V_{RTC}
2	GND

The battery is not rechargeable, and can be connected to the board using dedicated connector CN3 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 VISION are compliant to requirements of European Directive 2006/66/EC regarding batteries and accumulators. When putting out of order UDOO VISION, 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 VISION board, the current consumption (RMS) has been measured on the V_{IN} Power line when the board is supplied through DC power jack CN2 using a +12V_{DC} Notebook DC Adapter.

- O.S. Windows 10 Professional
- USB mouse and keyboard connected
- UEFI BIOS Release 1.01

Status	SoC / Configuration							
	Intel® Atom® E3950 64GB eMMC 8GB RAM				Intel® Atom® E3940 32GB eMMC 4GB RAM			
	Average Value (60s)		Peak Value		Average Value (60s)		Peak Value	
	W	A	W	A	W	A	W	A
Idle, power saving configuration	3.45	0.288	4.45	0.370	3.03	0.252	3.44	0.286
OS Boot, power saving configuration	5.95	0.494	14.20	1.183	5.23	0.436	12.04	1.003
Video reproduction@1080p, power saving configuration	6.33	0.527	9.26	0.772	5.69	0.474	8.47	0.705
Video reproduction 4K, power saving configuration	9.57	0.797	14.74	1.228	8.74	0.728	10.75	0.895
Internal Stress Test Tool, maximum performance	22.53	1.887	24.13	2.011	14.56	1.213	15.97	1.330

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

Battery Backup power consumption: 3.4μA
 Soft-Off State power consumption: 78.7mA
 Suspend State power consumption: 89.8mA

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

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



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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.

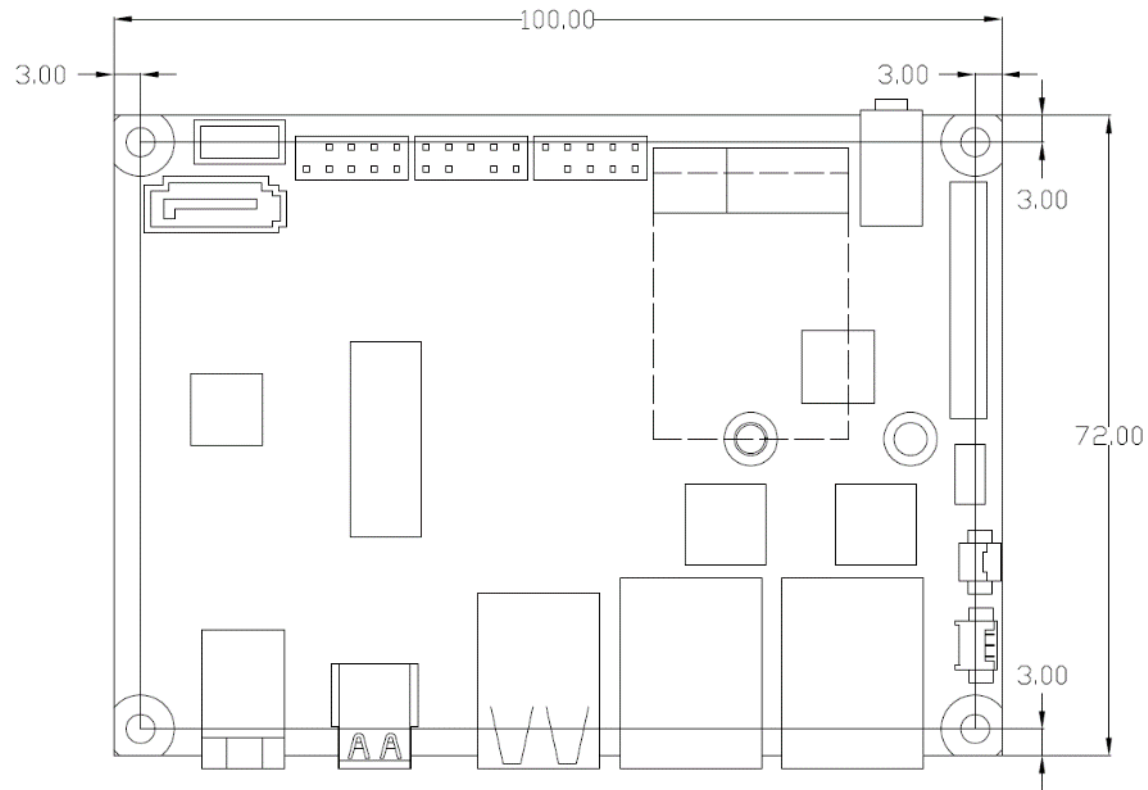
Other suffixes are used for application specific power rails, which are derived from same voltage value of voltage switched rails, if it is not differently stated.



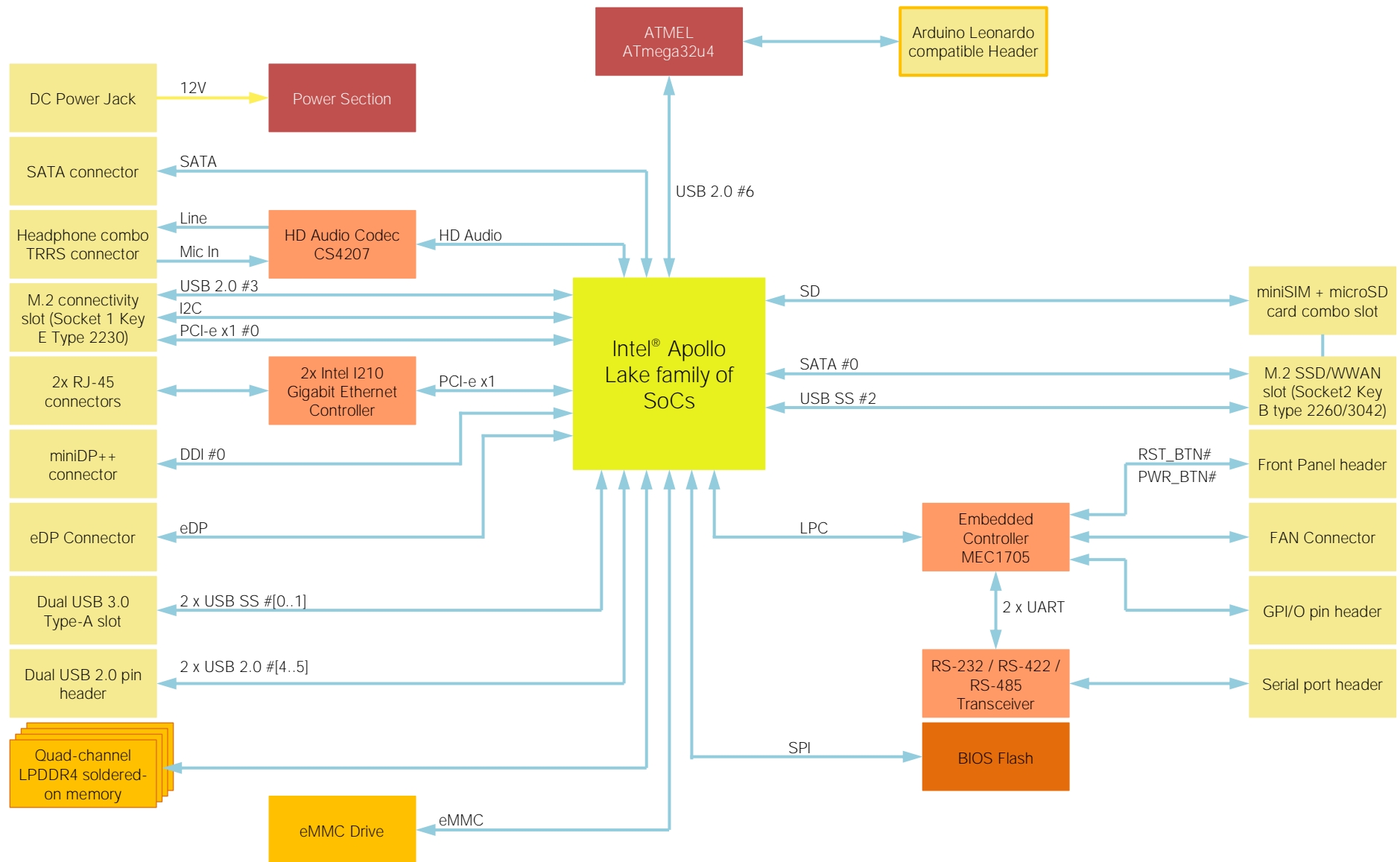
2.4 Mechanical specifications

The board dimensions are 72x100mm (2.83" x 3.93").

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

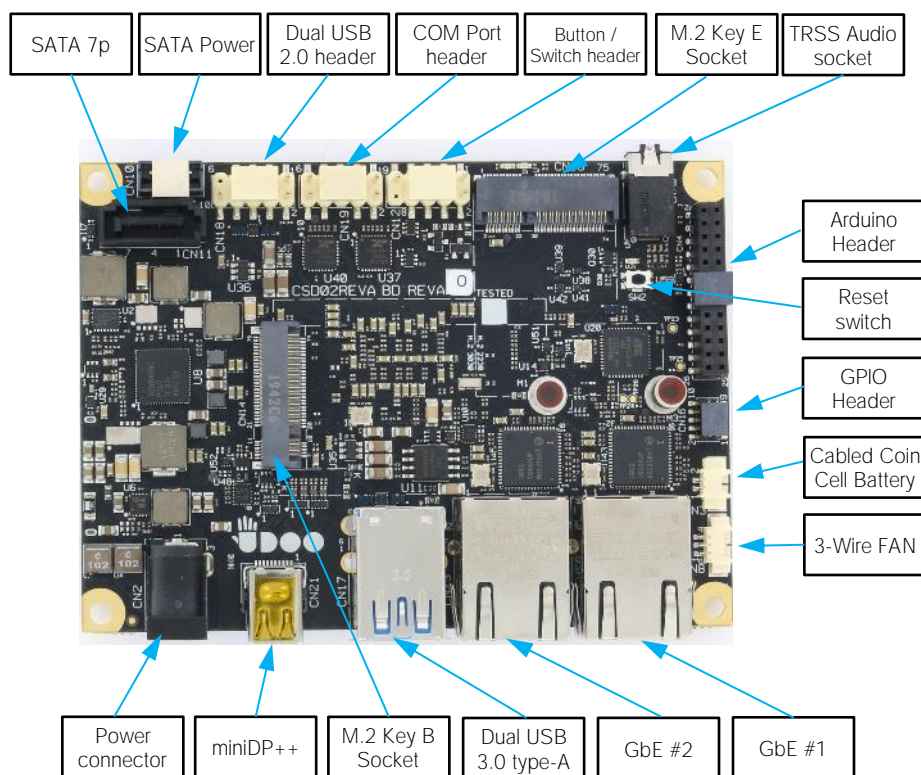


3.1 Introduction

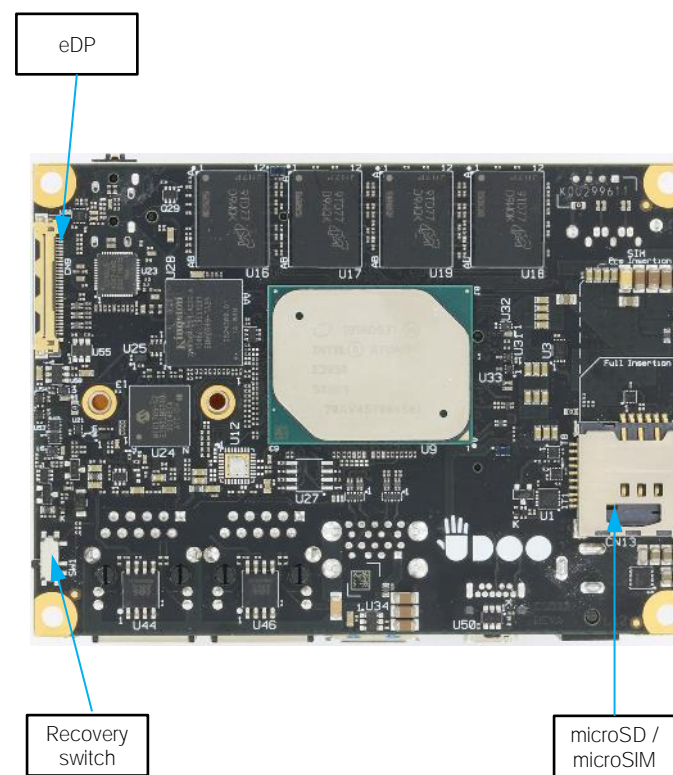
On UDOO VISION board, there are several connectors located on the upper plane. Standard connectors are placed on the same side of PCB, so that it is possible to place them on a panel of an eventual enclosure.

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

TOP SIDE



BOTTOM SIDE



3.2 Connectors overview

Name	Description	Name	Description
CN2	DC Power Jack	CN16	GPIO Header
CN3	Cabled Coin Cell Battery	CN17	Dual USB 3.0 Type-A connector [0..1]
CN4	Arduino Leonardo header	CN18	Dual USB 2.0 Internal Header #4 #5
CN7	TRSS Audio Socket	CN19	COM Port Internal Header
CN8	3-Wire FAN Connector	CN20	GbE #1 RJ-45 Connector
CN9	eDP Connector	CN21	miniDP++ connector
CN10	SATA Power Connector	CN23	GbE #2 RJ-45 Connector
CN11	SATA 7p M Connector	SW1	Recovery switch
CN12	Buttons / LED Header	SW2	Reset switch
CN13	Combo microSD / microSIM Slot		
CN14	M.2 2260/3042 Socket 2 Key B (SSD/WWAN)		
CN15	M.2 2230 Socket 1 Key E (Connectivity Slot)		

3.3 Connectors description

3.3.1 Ethernet connectors

GbE #1 RJ-45 Connector – CN20

Pin	Signal	Pin	Signal
1	GBE1_MDIO+	5	GBE1_MDI2-
2	GBE1_MDIO-	6	GBE1_MDI1-
3	GBE1_MDI1+	7	GBE1_MDI3+
4	GBE1_MDI2+	8	GBE1_MDI3-

GbE #2 RJ-45 Connector – CN23

Pin	Signal	Pin	Signal
1	GBE2_MDIO+	5	GBE2_MDI2-
2	GBE2_MDIO-	6	GBE2_MDI1-
3	GBE2_MDI1+	7	GBE2_MDI3+
4	GBE2_MDI2+	8	GBE2_MDI3-

On board, there are two Gigabit Ethernet connector, for the direct connection of the UDOO VISION board to two different wired LANs.

The Ethernet connection is realised by using two different Intel® I21x family Gigabit Ethernet controllers.

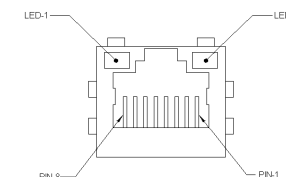
These two interfaces are available through RJ45 connectors CN20 and CN23.

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.

On the connectors there are also two bicolor (Green /Yellow) LEDs for each port. Left LED shows 10/100 or 1000 connection: green means 100Mbps connection, yellow means 1000Mbps connection, when the LED is Off then 10Mbps or no connection is available.

The right LED blinks Green to show ACTIVITY presence.



GBEx_MDIO+/GBEx_MDIO-: Ethernet Controller #x 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.

GBEx_MDI1+/GBEx_MDI1-: Ethernet Controller #x 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.

GBEx_MDI2+/GBEx_MDI2-: Ethernet Controller #x 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.

GBEx_MDI3+/GBEx_MDI3-: Ethernet Controller #x 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

Dual USB 3.0 Type-A Connector – CN17

Pin	Signal	Pin	Signal
1	+5V _{USB1}	10	+5V _{USB0}
2	USB_P1-	11	USB_P0-
3	USB_P1+	12	USB_P0+
4	GND	13	GND
5	USB_SSRX1-	14	USB_SSRX0-
6	USB_SSRX1+	15	USB_SSRX0+
7	GND	16	GND
8	USB_SSTX1-	17	USB_SSTX0-
9	USB_SSTX1+	18	USB_SSTX0+

Dual USB 2.0 Internal Header #4 #5 – CN18

Pin	Signal	Pin	Signal
1	+5V _{USB4}	2	+5V _{USB5}
3	USB_P4-	4	USB_P5-
5	USB_P4+	6	USB_P5+
7	GND	8	GND
		10	---

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

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

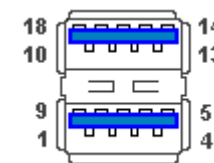
USB_P5+/USB_P5-: USB 2.0 Port #5 differential pair.

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.

The UDOO VISION board offers the possibility of connecting to many standard USB ports.

USB 3.0 ports are carried to a double type-A USB 3.0 receptacle, CN17, type Winning p/n WDU3R-18F1B4PBUN3 or equivalent.

More specifically, USB 3.0 port #0 is carried to the upper USB receptacle of CN17, while USB 3.0 port #1 is carried to the lower USB receptacle of CN17



There are also two additional USB 2.0 ports (USB #4 and USB #5), which are hosted on a 9-pin p2.54mm pin header, h= 6mm, type NELTRON p/n 2213S-10G-E9 or equivalent, with the pinout shown in the tables on the left (it is a common pinout for USB headers in PC motherboards).



All USB ports' voltages (+5V_{USBx}) are derived from +5V_{ALW} standby voltages. This means that the ports can be powered also when the OS is in Suspend-to-RAM (S3) state in order to support (if enabled) the "Wake-Up on USB" functionality.

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.

3.3.3 S-ATA Connectors

The Apollo Lake family of SoCs embeds a SATA Controller, which offers two SATA III, 6.0 Gbps interfaces.

S-ATA Connector – CN11

Pin	Signal
-----	--------

1	GND
2	SATA1_Tx+
3	SATA1_Tx-
4	GND
5	SATA1_Rx-
6	SATA1_Rx+
7	GND

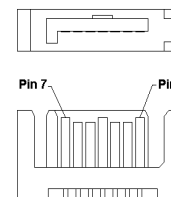
Of these interfaces, one SATA channel is carried out to a standard male S-ATA connector, CN11 (the other SATA channel is available on the M.2 Key B socket, CN14, please check par. Errore. L'origine riferimento non è stata trovata.)

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 – CN10

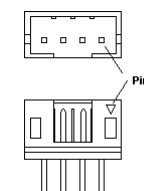
Pin	Signal
-----	--------

1	---
2	GND
3	GND
4	+5V_RUN

A dedicated power connector, CN10, can be used to give supply to external Hard Disks (or Solid State Disks) connected to the SATA male connector.

The dedicated power connector is a 4-pin male connector, type HR p/n A2001WV-S-04 or equivalent, with pinout shown in the table on the left.

Mating connector: HR A2001H-04P housing with HR A2001 series crimp terminals.

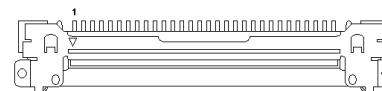


3.3.4 eDP connector

eDP Connector – CN9			
Pin	Signal	Pin	Signal
1	---	16	GND
2	BKLT_VCC	17	---
3	BKLT_VCC	18	LCD_VCC
4	BKLT_VCC	19	LCD_VCC
5	BKLT_VCC	20	GND
6	---	21	eDP_AUX_N
7	---	22	eDP_AUX_P
8	BKLT_PWM	23	GND
9	eDP_BKLTEN	24	eDP0_P
10	GND	25	eDP0_N
11	GND	26	GND
12	GND	27	eDP1_P
13	GND	28	eDP1_N
14	eDP_HPD	29	GND
15	GND	30	---

The UDOO VISION board offer a dedicated embedded Display Port interface.

For the connection of this kind of displays, on-board there is a VESA® certified connectors for embedded Display Port interface, type STARCONN p/n 300E30-0110RA-G3 or equivalent (microcoaxial cable connector, 0.5mm pitch, 30 positions).



On this connector, BKLT_VCC and LCD_VCC are the software-enabled voltage rails that can be used to supply the LCD and related Backlight Unit.

The LCD software-driven voltage, i.e. signal LCD_VCC, can be factory regulated to be connected to +3.3_ALW or +5V_ALW.

Instead, the backlight software-driven voltage, i.e. signal BKLT_VCC, can be factory regulated to be connected to +5V_ALW or +12V_ALW.

These are factory configurations, please take care of specifying which is the configuration needed for LCD_VCC and BKLT_VCC voltage rail.

Here following the signals involved in eDP management:

eDP0_P/eDP0_N : embedded DP differential data pair #0.

eDP1_P/eDP1_N: embedded DP differential data pair #1.

eDP_AUX_N/eDP_AUX_P: embedded DP auxiliary channel differential data pair.

eDP_HPD: embedded DP Hot Plug Detect.

BKLT_PWM: this signal can be used to adjust the backlight brightness in displays supporting Pulse Width Modulated (PWM) regulations (electrical level +3.3V_RUN).

eDP_BKLTEN: Backlight enable signal, electrical level +3.3V_RUN.

3.3.5 miniDP++ Connector

miniDP++ Connector- CN21			
Pin	Signal	Pin	Signal
1	GND	2	DPO_HPD
3	DPO_LANE0+	4	DPO_CAD
5	DPO_LANE0-	6	DPO_CEC
7	GND	8	GND
9	DPO_LANE1+	10	DPO_LANE3+
11	DPO_LANE1-	12	DPO_LANE3-
13	GND	14	GND
15	DPO_LANE2+	16	HDMI0_CTRL_CLK / DPO_AUX+
17	DPO_LANE2-	18	HDMI0_CTRL_DAT / DPO_AUX-
19	GND	20	+3.3V_RUN

DPO_LANE1+/DPO_LANE1-: Display Port differential pair #1.

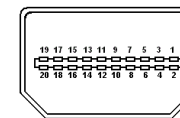
DPO_LANE2+/DPO_LANE2-: Display Port differential pair #2.

DPO_LANE3+/DPO_LANE3-: Display Port differential pair #3.

DPO_HPD: Hot Plug Detect Input signal.

HDMI0_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.

On the UDOO VISION board, the Digital Display Interfaces #0 is 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 miniDP connector, type ADAM-TECH p/n MDPC-S-RA-KT-TR 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 DPO_CAD signal available on pin 4.

When a DP cable is connected, then the DPO_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 DPO_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:

DPO_LANE0+/DPO_LANE0-: Display Port differential pair #0.

3.3.6 Audio interfaces

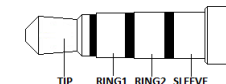
In the UDOO VISION board, audio functionalities are provided by a Cirrus Logic CS4207 High Definition Audio Codec.

TRRS Audio socket- CN7

Pin	Signal
TIP	Headphone Out Left Channel
RING1	Headphone Out Right Channel
RING2	MIC_IN_L
SLEEVE	MIC_IN_R

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.



3.3.7 Buttons / LED header

Buttons / LED Header – CN12			
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 the UDOO VISION\ board 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 CN12 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_ALW electrical level with 10kΩ pull-up.

PWR_SW_P: Power button input signal, +3.3V_ALW electrical level with 10kΩ pull-up. This signal has to 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.

PWR_SW_N: Power button GND

FP PWR_P/SLP_N: Power/Sleep messaging LED terminal 1, +5V_ALW 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, +5V_ALW voltage. Connect it to the other extremity of the dual-color power LED above mentioned.

3.3.8 M.2 2260/3042 Socket 2 Key B SSD/WWAN Slot

M.2 SSD/WWAN Slot (Socket 2 Key B type 2260/3042) – CN14

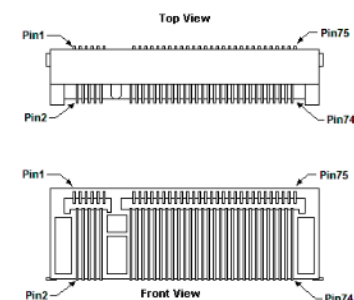
Pin	Signal	Pin	Signal
1	CONFIG_3	2	+3.3V_ALW
3	GND	4	+3.3V_ALW
5	GND	6	PWR_OFF#
7	USB_P2+	8	KEYB_W_DISABLE1#
9	USB_P2-	10	---
11	GND	20	---
21	CONFIG_0	22	---
23	WAKE_ON_WWAN#	24	---
25	---	26	KEYB_W_DISABLE2#
27	GND	28	---
29	USB_SSRX2-	30	UIM_RST#
31	USB_SSRX2+	32	UIM_CLK
33	GND	34	UIM_DATA
35	USB_SSTX2-	36	UIM_PWR
37	USB_SSTX2+	38	---
39	GND	40	---
41	SATA_Rx0+	42	---
43	SATA_RX0-	44	---
45	GND	46	---
47	SATA_TX0-	48	---
49	SATA_TX0+	50	PLT_RST#
51	GND	52	---
53	---	54	---
55	---	56	---
57	GND	58	---
59	---	60	---

The mass storage capabilities of the UDOO VISION board are completed by an M.2 SSD Slot, which allow plugging M.2 Socket 2 Key B Solid State Drives.

The same slot can be used alternatively for the connection of Connectivity modules, using USB 3.0 interface.

The connector used for the M.2 SSD slot is CN14, 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 SBC-C41 board there is also a Threaded Spacer which allows the placement of M.2 Socket 2 Key B SSD or WWAN modules in 2260 or 3042 size.



61	---	62	---
63	---	64	---
65	---	66	UIM_DETECT
67	---	68	---
69	CONFIG_1	70	+3.3V_ALW
71	GND	72	+3.3V_ALW
73	GND	74	+3.3V_ALW
75	CONFIG_2		

Signal Description

USB_P2+ / USB_P2-: USB Port #2 differential pair; it is managed by the processor's xHCI controller.

WAKE_ON_WWAN#: Board's Wake Input, 1.8V_ALW active low signal with 100kΩ pull-up resistor. It must be externally driven by the Connectivity module plugged in the slot when it requires waking up the system (functionality not yet supported by the BIOS).

USB_SSRX2+/USB_SSRX2-: USB Super Speed Port #2 receive differential pair; it is managed by xHCI controller

USB_SSTX2+/USB_SSTX2-: USB Super Speed Port #2 transmit differential pair; it is managed by xHCI controller

SATA0_TX+/SATA0_TX-: Serial ATA Channel #0 Transmit differential pair

SATA0_RX+/SATA0_RX-: Serial ATA Channel #0 Receive differential pair

PWR_OFF#: Power Off signal for plugged modules, usually used in battery-powered systems. Fixed 2k2Ω pull-up @ 1.8V_ALW

KEYB_W_DISABLE1#: M.2 Key B module disable signal #1, 3.3V_ALW active low output

KEYB_W_DISABLE2#: M.2 Key B module disable signal #2, 3.3V_ALW active low output

UIM_RESET: Reset signal line, sent from M.2 WWAN card to the UIM module.

UIM_DATA: Bidirectional Data line between M.2 WWAN card and UIM module.

UIM_CLK: Clock line, output from M.2 WWAN card to the UIM module.

UIM_PWR: Power line for UIM module.

PLT_RST#: Reset Signal that is sent from the SoC to all devices available on the board (i.e. the GbE controllers and the modules plugged in the CN15 slot). It is a 3.3V_ALW active-low signal with 100kΩ pull-down.

CONFIG_[0..3]: Configuration inputs, +3.3V_ALW signals with 10kΩ pull-up. These signals are used to configure properly the Main Host interface according to the Add-In Card plugged in CN14 Slot. These configuration pins are managed according to PCI Express M.2 Specifications Table 5.5. Only SATA SSDs and WWAN USB3.1 modules are supported.



3.3.9 M.2 2230 Socket 1 Key E Connectivity Slot

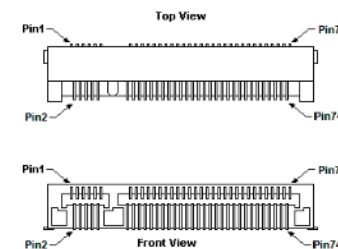
M.2 Connectivity Slot (Socket 1 Key E type 2230) - CN15

Pin	Signal	Pin	Signal
1	GND	2	+3.3V_ALW
3	USB_P3+	4	+3.3V_ALW
5	USB_P3-	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	PCIe0_Tx+	36	---
37	PCIe0_Tx-	38	---
39	GND	40	---
41	PCIe0_Rx+	42	---
43	PCIe0_Rx-	44	---
45	GND	46	---
47	PCIe0_CLK+	48	---
49	PCIe0_CLK-	50	SUS_CLK
51	GND	52	PLT_RST#
53	CLK_REQ0#	54	KEYE_W_DISABLE2#
55	PCIe_WAKE#	56	KEYE_W_DISABLE1#
57	GND	58	---

It is possible to increase the connectivity of the UDOO VISION board by using M.2 Socket 1 Key E connectivity slot.

The connector used for the M.2 Connectivity slot is CN15, 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 VISION board there is also a Threaded Spacer which allows the placement of M.2 Socket 1 Key E connectivity modules in 2230 size.



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		

Signal Description

USB_P3+ / USB_P3-: USB Port #3 differential pair; it is managed by the processor's xHCI controller.

PCIe0_Tx+/PCIe0_Tx-: PCI Express lane #0, Transmitting Output Differential pair

PCIe0_Rx+/PCIe0_Rx-: PCI Express lane #0, Receiving Input Differential pair

PCIe0_CLK+ / PCIe0_CLK-: PCI Express Reference Clock for lane #0, Differential Pair

PCIe_WAKE#: Board's Wake Input, it must be externally driven by the module inserted in the slot when it requires waking up the system.

CLK_REQ0#: PCI-e Clock request. Bidirectional signal, electrical level +3.3V_ALW with a 10K Ω pull-up resistor

SUS_CLK: 32.768kHz Clock provided by the SBC-C41-pITX board to the module plugged in the slot CN15. +3.3V_ALW electrical level.

PLT_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board (i.e. the GbE controllers and the modules plugged in the CN14 slot). It is a 3.3V_ALW active-low signal with 100k Ω pull-down.

KEYE_W_DISABLE1#: M.2 Key E module disable signal #1, 3.3V_ALW active low output

KEYE_W_DISABLE2#: M.2 Key E module disable signal #2, 3.3V_ALW active low output

3.3.10 μ SD + miniSIM Combo Slot

μ SD + miniSIM Combo Card Slot – CN13			
Pin	Signal	Pin	Signal
S1	UIM_PWR	T3	SDIO_CMD
S2	UIM_RST#	T4	SDIO_VDD
S3	UIM_CLK	T5	SDIO_CLK
S4	GND	T6	GND
S5	---	T7	SDIO_DAT0
S6	UIM_DATA	T8	SDIO_DAT1
T1	SDIO_DAT2	ST1	SDIO_CD#
T2	SDIO_DAT3	ST2	GND

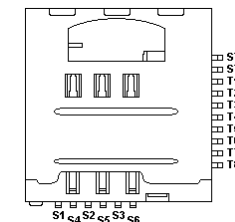
On UDOO VISION board there is also a socket, for the use of standard SD cards, to be used as Mass Storage Device and/or Boot Device.

Moreover, UDOO VISION board can accept also miniSIM cards, for use of M.2 Key B modems.

Both these cards can be inserted in the dedicated slot of connector CN13, which is a combo μ SD/MMC + miniSIM connector, push-push type, 2.7 mm global height, type AVX p/n 009162006501150 or equivalent. Pinout here reported is related only to signal routing on specific connector; internally the pin-out is the same of any standard SD/MMC 4.0 and miniSIM card.

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

Signals related to UIM (SIM) card are described in paragraph 3.3.8 for description. Signals related to SD cards are the following:



SDIO_CD#: Card Detect Input.

SDIO_CLK: SD Clock Line (output).

SDIO_CMD: Command/Response bidirectional line.

SD_DATA[0÷3]: SD Card data bus. SD_DATA0 signal is used for all communication modes. SD_DATA[1÷3] signals are required for 4-bit communication mode.

SDIO_VDD: +3.3V_ALW SD dedicated Power rail

3.3.11 COM Port Header

Dual RS-232/RS-422/RS-485 pin header- CN19			
Pin	Signal RS-232 mode	Signal RS-422 mode	Signal RS-485 mode
1	COM1_RxD	COM1_Rx+	
2	COM2_RxD	COM2_Rx+	
3	COM1_TxD	COM1_Tx-	COM1_Data-
4	COM2_TxD	COM2_Tx-	COM2_Data-
5	GND	GND	GND
7	COM1_RTS#	COM1_Tx+	COM1_Data+
8	COM2_RTS#	COM2_Tx+	COM2_Data+
9	COM1_CTS#	COM1_Rx-	
10	COM2_CTS#	COM2_Rx-	

COM1_RX+/COM1_RX-: COM port #1 RS-422 receive differential pair

COM1_TX+/COM1_TX-: COM port #1 RS-422 Transmit differential pair

COM2_RX+/COM2_RX-: COM port #2 Full Duplex RS-485 (RS-422) Receive differential pair

COM2_TX+/COM2_TX-: COM port #2 Full Duplex RS-485 (RS-422) Transmit differential pair


COM1_Data+/COM1_Data-: COM Port #1 Half Duplex RS-485 Differential Pair

COM2_Data+/COM2_Data-: COM Port #2 Half Duplex RS-485 Differential Pair

The selection of the kind of interface (RS-232, RS-422 or RS-485) can be made via BIOS.

Please be aware that for proper RS-485 working, the RTS# signals must be used as a handshaking signal, i.e. it is used to control the data flow direction. When RTS# signal is driven low, then the RS-485 port is in receiving mode, when RTS# signal is driven high then the RS-458 port is in transmitting mode.

The embedded controller of UDOO VISION board manages two 4-wire legacy UARTs, which are carried to as many multistandard RS-232/RS-422/RS-485 transceivers, allowing the implementation of two multistandard serial ports (from now on respectively named COM1 and COM2).

These ports are available on dedicated connector CN19,  which is an internal 9-pin standard male pin header, p 2.54 mm, 5+4 pin, h = 6mm, type NELTRON p/n 2213S-10G-E06 or equivalent.

Signals Description

COM1_RxD/COM2_RxD: COM port #1 / #2 RS-232 Receive data

COM1_TxD/COM2_TxD: COM port #1 / #2x RS-232 Transmit data

COM1_RTS#/COM2_RTS#: COM port #1 / #2 RS-232 Request to Send handshaking signal.

COM1_CTS#/COM2_CTS#: COM port #1 / #2x RS-232 Clear To Send handshaking signal

3.3.12 FAN Connector

3-Wire FAN Connector – CN8

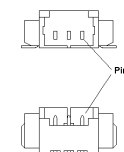
Pin	Signal
1	GND
2	FAN_POWER
3	FAN_TACHO_IN

Depending on the usage model of UDOO VISION, for critical applications/environments it is available a dedicated connector for an external +12V_{DC} FAN.

The FAN Connector is a 3-pin single line SMT connector, type MOLEX 53261-0371 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_ALW derived power rail for FAN.

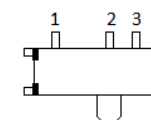
FAN_TACHO_IN: tachometric input from the FAN to the embedded microcontroller, +3.3V_RUN electrical level signal with 10kΩ pull-up resistor.

3.3.13 Recovery 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 board it has been placed a 3-way switch SW1 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 board. The contact MUST be now placed back to 2-3 position.

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



3.3.14 GPIO Header

GPIO Header – CN16

Pin	Signal	Pin	Signal
1	+3.3V_RUN	2	GND
3	EXT_GPIO0	4	EXT_GPIO7
5	EXT_GPIO1	6	EXT_GPIO6
7	EXT_GPIO2	8	EXT_GPIO5
9	EXT_GPIO3	10	EXT_GPIO4

Managed by the Embedded Controller, on UDCOO VISION board there are 8 (eight) GPIOs at electrical level 3.3V_RUN (5V tolerant).



Access to these General Purpose I/Os comes through a dual-row 10-pin SMT male pin-header, p. 1.27mm, type NELTRON 2199SB-10G-SM-3021-CR or equivalent, with pinout shown in the table on the left.

EXT_GPIO_[0..7]: I/O Expander Input/Output [0..7], voltage reference level: +3.3V_

3.3.15 ARDUINO™ interface

Arduino™ Interface Connector – CN4			
Pin	Signal	Pin	Signal
1	MISO	2	5V_ALW
3	SCK	4	MOSI
5	ATM_RESET#	6	GND
7	D0 / RX	8	A5
9	D1 / TX	10	A4
11	D2 / SDA	12	A3
13	D3 / SCL	14	A2
15	D5*	16	A1
17	D6*	18	A0
19	D7	20	AREF
21	IO8	22	3.3V_ALW
23	IO9*	24	IO10*
25	IO11*	26	IO13*

On a 26-way 2x13 Dual row p.2mm dedicated female header, type NELTRON p/n 2207SM-26G-635-PCT, is realised an Arduino™ Leonardo interface, which is managed by an ATMEGA32U4 microcontroller, connected to the Intel Apollo Lake 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 it is also available a miniaturized momentary switch SW2, that can be used to reset the ATmega32u4 microcontroller.

Chapter 4.

BIOS SETUP

- Aptio setup Utility
- Main setup menu
- Advanced menu
- Security menu
- Power menu
- Boot menu
- 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.

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
Trusted Computing	See submenu	Trusted Computing Settings
ACPI Settings	See submenu	System ACPI parameters
S5 RTC Wake Settings	See submenu	Enable system to wake from S5 using RTC alarm
CPU Configuration	See submenu	CPU Configuration Parameters
AMI Graphic Output Protocol Policy	See submenu	User Selected Monitor Output by Graphic Output protocol
PCI Subsystems Settings	See submenu	PCI Subsystems 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
Platform Trust technology	See submenu	Platform Trust Technology
Main Thermal Configuration	See submenu	Main Thermal Configuration
HSUART Transceiver Configuration	See submenu	HSUART Transceiver Configuration Utility
SMBIOS Information	See submenu	SMBIOS Information
Embedded Controller	See submenu	Embedded Controller Parameters
M.2 peripheral management	See submenu	M.2 peripheral management

4.3.1 Trusted computing submenu

Menu Item	Options	Description
Security Device Support	Enabled / Disabled	Enables or Disables BIOS support for security device. OS will not show the Security Device. TCG EFI protocol and INT1A interface will not be available. When enabled all the following items will be available.
SHA-1 PCR Bank	Enabled / Disabled	Enables or Disables SHA-1 PCR Bank
SHA256 PCR Bank	Enabled / Disabled	Enables or Disables SHA256 PCR Bank
Pending Operation	None / TPM Clear	Schedule an Operation for the Security Device. NTE: your Computer will reboot during restart in order to change State of Security Device.
Platform Hierarchy	Enabled / Disabled	Enables or Disabled the Platform Hierarchy
Storage Hierarchy	Enabled / Disabled	Enables or Disabled the Storage Hierarchy
Endorsement Hierarchy	Enabled / Disabled	Enables or Disabled the Endorsement Hierarchy
TPM2.0 UEFI Spec Version	TCG_1_2 TCG_2	Select the TCG Spec Version support. TCG_1_2 is the compatible mode for Windows 8 / Windows 10. TCG 2 supports the new TCG2 protocol and event format for Windows 10 or later.
Physical Presence Spec Version	1.2 / 1.3	Select to tell OS to support PPI Spec Version 1.2 or 1.3. Please 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

4.3.2 ACPI Settings submenu

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 Hibernate (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

4.3.3 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. When not disabled, the following items will appear
Wake up hour	0..23	Select the wake up hour in range 0..23. Enter 3 for 3am, 15 for 3pm.
Wake up minute	0..59	Select the wake up hour in range 0..59
Wake up second	0..59	Select the wake up hour in range 0..23. Enter 3 for 3am, 15 for 3pm.
Day of Month	1..31	Only available when "Wake System from S5" is set to "By Day of Month". Set the wake up day of month in range 1..31. Error checking will be done against mm/dd/yr combinations that are not valid).



4.3.4 CPU Configuration submenu

Menu Item	Options	Description
Detailed CPU Information		Shows board's specific SoC information
CPU Power Management	See Submenu	CPU Power Management options
Active Processor Cores	Disabled / Enabled	Number of Cores to enable in each processor package
Core 1 Core 2 Core 3	Disabled / Enabled	Core #x Enable / Disable. Only available when "Active Processor Cores" is enabled
Intel Virtualization Technology	Disabled / Enabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology
VT-d	Disabled / Enabled	Enables or disables CPU VT-d
Bi-directional PROCHOT	Disabled / Enabled	When a processor thermal sensor trips (either core), the PROCHOT# will be driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor
Thermal Monitor	Disabled / Enabled	Enables or disables the Thermal Monitor
Monitor Mwait	Disabled / Enabled / Auto	Enables or disables Monitor Mwait
P-STATE Coordination	HW_ALL / SW_ALL / SW_ANY	Change P-STATE Coordination type
DTS	Disabled / Enabled	Enables or disables the Digital Thermal Sensor

4.3.4.1 CPU Power Management submenu

Menu Item	Options	Description
EIST	Disabled / Enabled	Enables or disables Intel® SpeedStep
Turbo mode	Disabled / Enabled	Only Available when "EIST" is enabled. Enables or disables the Turbo Mode
Boot Performance mode	Max performance Max battery	Select the performance state that the BIOS will set before OS handoff.
Power Limit 1 Enable	Disabled / Enabled	Enables or disables Power Limit 1. When Enabled, the following menu items will appear-
Power Limit 1 Clamp Mode	Disabled / Enabled	When Power Limit 1 is Enabled, enables or disables the Clamp Mode
Power Limit 1 Power	Auto / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10	Power Limit 1 in Watts. Auto will program Power Limit 1 based on silicon default support value.
Power Limit 1 Time Windows	Auto / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 10 / 12 / 14 / 16 / 20 / 24 / 28 / 32 / 40 / 48 / 56 / 64 / 80 / 96 / 112 / 128	Power Limit 1 Time Window Value in Seconds. Auto will program the Power Limit 1 Time Window based on silicon default support value

4.3.5 AMI graphic Output Protocol Policy submenu

Menu Item	Options	Description
Output Select	eDP DP++	Output video interface selection

4.3.6 PCI Subsystems Settings

Menu Item	Options	Description
Above 4G Decoding	Enabled / Disabled	Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding)
BME DMA Mitigation	Enabled / Disabled	Re-enable Bus Master Attribute, disabled during Pci enumeration for PCI Bridges after SMM Looked
Hot-Plug support	Enabled / Disabled	Globally Enables or Disables Hot-Plug support for the entire System. If System has Hot-Plug capable Slots and this option set to Enabled, it provides a Setup screen for selecting PCI resource padding for Hot-Plug

4.3.7 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
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

4.3.8 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 Stack	Do not launch UEFI Legacy	Controls the execution of UEFI and Legacy PXE OpROM
Storage Hierarchy	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 or Video
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4.3.9 NVMe configuration submenu

4.3.10 SDIO configuration submenu

Menu Item	Options	Description
SDIO Access Mode	Auto ADMA SDMA PIO	Auto Option: Access the SD Device in DMA mode if the controller supports it, otherwise in PIO Mode. DMA Option: Access the SD Device in DMA mode ADMA Option: Access the SD Device in Advanced DMA mode PIO Option: Access the SD Device in PIO mode
<i>List of SDIO devices found</i>	Auto Floppy Forced FDD Hard Disk	Mass storage device emulation type. 'Auto' enumerates devices less than 530Mb as floppies. Forced FDD option can be used to force HDD formatted drive to boot as FDD.

4.3.11 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 value (for a Root port it is 100ms, for a Hub port the delay is taken from the Hub descriptor).

4.3.12 Platform Trust technology submenu

Menu Item	Options	Description
fTPM	Enabled / Disabled	Enable/Disable fTPM

4.3.13 Main Thermal Configuration submenu

Menu Item	Options	Description
Critical Temperature (°C)	Settable Threshold (°C) [80 .. 110]	Above this threshold, an ACPI aware OS performs a critical shut down. Allowed range is from 80 to 110 included, where 110 means disabled.
Passive Cooling Temperature (°C)	Settable Threshold (°C) [60 .. 105]	Above this threshold, an ACPI aware OS begins to lower the CPU speed. Allowed range is from 60 to 105 included, where values not below Critical Temperature mean disabled.
TC1	[0...16]	Thermal Constant 1: part of the ACPI Passive Cooling Formula
TC2	[0..16]	Thermal Constant 2: part of the ACPI Passive Cooling Formula
TSP (seconds)	[2..32]	Period of temperature sampling when Passive Cooling

4.3.14 HSUART Transceiver Configuration submenu

Menu Item	Options	Description
HSUART #0 Interface	RS-232 RS-422 RS-485	Select among RS232 (default), RS-422 or RS-485 interface. When selecting RS-422 or RS-485, the following menu item will appear
HSUART #0 RX termination	Disabled / Enabled	RX termination can be enabled when RS-422 or RS-485 is selected. Disable (default) or enable 120 Ohm RX Termination.
HSUART #0 TX termination	Disabled / Enabled	TX termination can be enabled when RS-422 or RS-485 is selected. Disable (default) or enable 120 Ohm TX Termination.
HSUART #2 Interface	RS-232 RS-422 RS-485	Select among RS232 (default), RS-422 or RS-485 interface. When selecting RS-422 or RS-485, the following menu item will appear
HSUART #2 RX termination	Disabled / Enabled	RX termination can be enabled when RS-422 or RS-485 is selected. Disable (default) or enable 120 Ohm RX Termination.
HSUART #2 TX termination	Disabled / Enabled	TX termination can be enabled when RS-422 or RS-485 is selected. Disable (default) or enable 120 Ohm TX Termination.

4.3.15 Embedded Controller submenu

Menu Item	Options	Description
Power Fail Resume Type	Always ON Always Off Last State	Specify what state to go to when power is re-applied after a power failure (G3 state). If Batteryless Operation, the chipset always powers on after a power failure: Always Off Resume Type or Last State when Last State was OFF will therefore require an immediate shutdown
No C-MOS battery handling	Disabled / Enabled	In systems with no C-MOS battery, the chipset always powers on after a power failure: Always OFF Resume Type or Last State when Last State was OFF will therefore require an immediate shutdown
OUT 80 redirection port	None / 1 / 2 / 1+2	Selects which Embedded Controller's UART(s) will receive OUT80 Post Codes: it can be none, 1 , 2 or 1+2
Hardware Monitor	See Submenu	Monitor hardware parameters and settings
Reset Causes Handling	See Submenu	Reset Causes Handling
Super IO Configuration	See Submenu	Super IO Configuration
Internal FAN Settings	See Submenu	Internal FAN Settings
Watchdog Configuration	See Submenu	Configure the Watchdog Timer
GPIO Configurations	See Submenu	GPIO Configurations
Arduino ATMEGA32	See Submenu	Arduino ATMEGA32 help

4.3.15.1 Monitor hardware parameters and settings submenu

This submenu contains Monitor hardware parameters and settings information:

- Up time
- CPU FAN speed
- RAM Temperature
- VCGI_RUN
- VNN_RUN
- MEM_VDD_SUS
- 1.24V_ALW
- 1.8V_ALW
- 1.05V_RUN

4.3.15.2 Reset Causes Handling submenu

Menu Item	Options	Description
Reset Button Pressed	Happened / Not happened	If Reset button is pressed, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If Reset button is pressed and Clear from log parameter is enabled, this will require system reset
WDT Timeout Expired	Happened / Not happened	If Watchdog Timer (WDT) timeout has expired, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If Watchdog Timer (WDT) timeout has expired, and Clear from log parameter is enabled, this will require system reset
Power Failure	Happened / Not happened	If a Power Failure occurs, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If a Power Failure occurs and Clear from log parameter is enabled, this will require system reset
E.C. soft reset	Happened / Not happened	If the Embedded Controller (E.C.) is reset, this parameter will automatically be set as Happened
Clear from log	Enabled / Disabled	If the Embedded Controller (E.C.) is reset and Clear from log parameter is enabled, this will require system reset

4.3.15.3 Super IO Configuration submenu

Menu Item	Options	Description
Serial Port 1	Enabled/Disabled	Enables or Disables Serial Port # 1
Address	0X3F8, 0x3E8, 0x2F8, 0x2F0, 0x2E8, 0x2E0, 0x2A8, 0x2A0, 0x288, 0x280	Select the Base address for Serial Port #1, if enabled.
IRQ	3 / 4 / 5 / 6 / 7 / 10 / 11 / 14 / 15	Select the IRQ line to assign to Serial Port #1, if enabled.
Serial Port 2	Enabled/Disabled	Enables or Disables Serial Port # 2
Address	0X3F8, 0x3E8, 0x2F8, 0x2F0, 0x2E8, 0x2E0, 0x2A8, 0x2A0, 0x288, 0x280	Select the Base address for Serial Port #2, if enabled.

IRQ	3 / 4 / 5 / 6 / 7 / 10 / 11 / 14 / 15	Select the IRQ line to assign to Serial Port #2, if enabled.
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4.3.15.4 Internal FAN Settings submenu

Menu Item	Options	Description
Temperature FAN Control	Enabled/Disabled	Disable/Enable Thermal Feed-back FAN Control
AC0 Temperature (C)	[70..100]	AC0: above this temperature the FAN runs at full speed
AC1 Temperature (C)	[5..100]	AC1: below this temperature the FAN is OFF; between AC1 AND AC0 the FAN runs at low speed: this never happens if AC1 is not below AC0
Temperature Hysteresis	[0..10]	This value is added to ACx Thresholds when temperature is growing and subtracted when it is lowering, to avoid oscillation
FAN Duty Cycle (%) Above AC1	[0..100]	FAN Duty Cycle (%) between AC1 and AC0 (low speed)
Speed change duration	[0..50]	Duration in seconds of linear FAN speed change. Allowed range: from 0 to 50

4.3.15.5 Watchdog Configuration submenu

Menu Item	Options	Description
Watchdog	Disabled / Enabled	Enables or disables the Watchdog Timer mechanism. When enabled, the following parameters will appear.
Event action	Raise WDT Signals Power Button Pulse	Select the Watchdog action when Event time-out expires
Reset action	System Reset Power Button Override Raise WDT Signal	Select the Watchdog action when Reset time-out expires
Watchdog delay	[0..60]	Minutes before watchdog normal operations starts. During delay time-out, a refresh operation will immediately trigger normal operation. Valid range is from 0 to 60.
Event time-out	[0..60]	Minutes without refresh before triggering selected event action. Refresh will restart the time-out. Valid range is from 0 to 60
Reset time-out	[1..60]	Minutes without refresh before triggering selected reset action, this timer will start when event time-out is expired. Refresh will restart the time-out. Valid range is from 1 to 60

4.3.15.6 GPIO Configurations submenu

Menu Item	Options	Description
Direction	Input / Output	Configure GPIOx pin as input or output. In case the GPIOx is configured as an output, the default output value can be configured
Default Output Value	Low / High / Last	To fix the GPIOx starting vale: Last means no changes with respect to the last boot. GPiX shows input x current value.

4.3.15.7 Arduino ATMEGA32 submenu

Menu Item	Options	Description
Power On Arduino-compatible	Disabled / Enabled	If enabled power on Arduino-compatible
Arduino-compatible Power Management	Enabled Disabled Wake Only	Enable / Disable system poweron and poweroff from Arduino-compatible via I09*, pin 23 on CN4 (see documentation) : Disabled = Arduino-compatible will never change power status of the system. Wake Only = Arduino-compatible will only be able to wake the system form S3/S4/S5
Arduino-compatible reset on power	Disabled / Enabled	If enabled the system will automatically reset the Arduino-compatible when the system is waking from a low power state (S3/S4/S5)

4.3.16 M.2 peripheral management submenu

Menu Item	Options	Description
WiFi on M.2	Disabled / Enabled	Enable Wifi capabilities of a WiFi M.2 Key E Card
Bluetooth on M.2	Disabled / Enabled	Enable Bluetooth capabilities of a BT M.2 Key E Card
WWAN on M.2	Disabled / Enabled	Enable WWAN capabilities of a WWAN M.2 Key B Card

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 4s", the system will simulate the pressure for 4 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	<i>List of HD Drives found connected</i>	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	<i>List of USB Disks found connected</i>	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

- Thermal Design
- Accessories



5.1 Thermal Design

A parameter that has to be kept in very high consideration is the thermal design of the system.

Highly integrated modules, like UDOO VISION board, offer to the user very good performances in minimal spaces, therefore allowing the system's minimization. On the counterpart, the miniaturizing of IC's and the rise of operative frequencies of processors lead to the generation of a big amount of heat, that must be dissipated to prevent system hang-off or faults.

For this reason, the UDOO VISION system comes along with specific active heatsink.

When using UDOO VISION system, it is necessary to consider carefully the heat generated by the module in the assembled final system, and the scenario of utilization.

Until the UDOO VISION system is used on a laboratory shelf, on free air, just for software development and system tuning, then the heatsink with integrated fan mounted on the board could be sufficient for cooling purpose. Anyhow, please remember that all depends also on the workload of the processor. Heavy computational tasks will generate much heat with all SOC's versions.

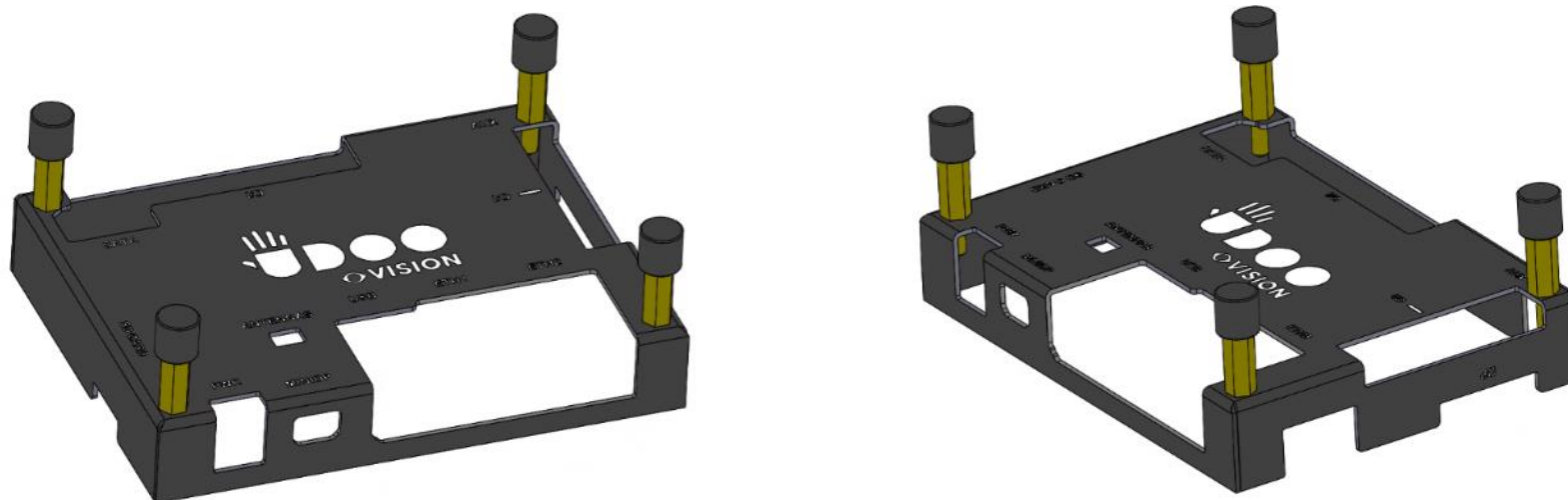
Therefore, it is always necessary that the customer studies and develops accurately the cooling solution for his system, by evaluating processor's workload, utilization scenarios, the enclosures of the system, the air flow and so on.



5.2 Accessories

5.2.1 Metal case

As a separated accessory, it is available a dedicated Metal case for UDOO VISION system (ordering p/n: KTMC-D02-COV01.00).



In case customer is going to use for UDOO VISION system a metal case different from the above provided by Seco S.p.A, please use an equivalent metal case that also complies with the requirements of the applicable standards, in particular to general and electrical safety standard IEC/EN 62368-1 applicable to your country.



SECO S.p.A. - Via A.Grandi 20
52100 Arezzo - ITALY
Ph: +39 0575 26979 - Fax: +39 0575 350210
www.udoo.org



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