SBC

User Manual

SBC-A80-eNUC

SBC with the N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs in the embedded NUC™ form factor

SECO

www.seco.com

REVISION HISTORY

Revision	Date	Note	Ref
1.0	8th April 2016	First Official Release.	SB
1.1	19th October 2016	Updated to rev. C of the PCB: - M.2_ALERT# signal on connector CN16 added - GPI/O Connector added - Paragraph 3.3.16 title corrected	SB
1.2	15th March 2017	BIOS Section updated	SB

Every effort has been made to ensure the accuracy of this manual. However, SECO S.r.l. accepts no responsibility for any inaccuracies, errors or omissions herein. SECO S.r.l. reserves the right to change precise specifications without prior notice to supply the best product possible.

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

- InsydeH2O™ Setup Utility - User Reference Guide

For further information on this module or other SECO products, but also to get the required assistance for any and possible issues, please contact us using the dedicated web form available at http://www.seco.com (registration required).

Our team is ready to assist.

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INTRODUCTION

- Warranty
- Information and assistance
- RMA number request
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- Terminology and definitions
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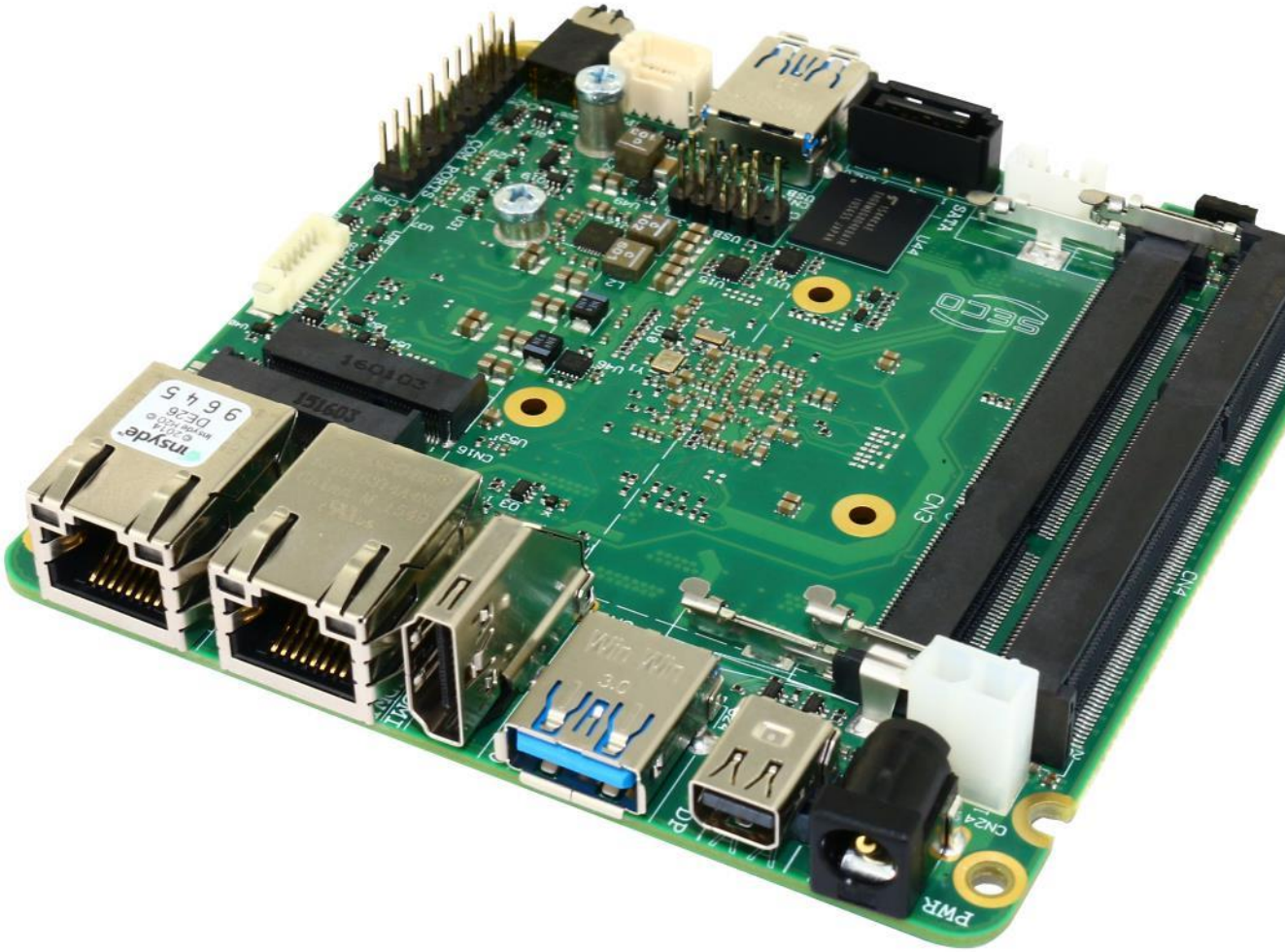


1.1 Warranty

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 1 year.

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.

Shipping costs that apply to non-conforming items or items that need replacement are to be paid by the customer.

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.seco.com/en/prerma (RMA Online). 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.

If any of the above mentioned requirements for the RMA is not satisfied, the item will be shipped back and the customer will have to pay any and all shipping costs.

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 the product is faulty?

SECO S.r.l. offers the following services:

- SECO website: visit http://www.seco.com to receive the latest information on the product. In most cases it is possible to find useful information to solve the problem.
- SECO Sales Representative: the Sales Rep can help to determine the exact cause of the problem and search for the best solution.
- SECO Help-Desk: contact SECO Technical Assistance. A technician is at disposal to understand the exact origin of the problem and suggest the correct solution.

  E-mail: technical.service@seco.com

  Fax (+39) 0575 340434
- 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 SECO's web-site. On the home page, please select "RMA Online" and follow the procedure described.

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

1.4 Safety

The SBC-A80-eNUC 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 SBC-A80-eNUC 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 SBC-A80-eNUC 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 SBC-A80-eNUC board is designed using RoHS compliant components and is manufactured on a lead-free production line. It is therefore fully RoHS compliant.

1.7 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)
eDP	embedded Display Port
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
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
SATA	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

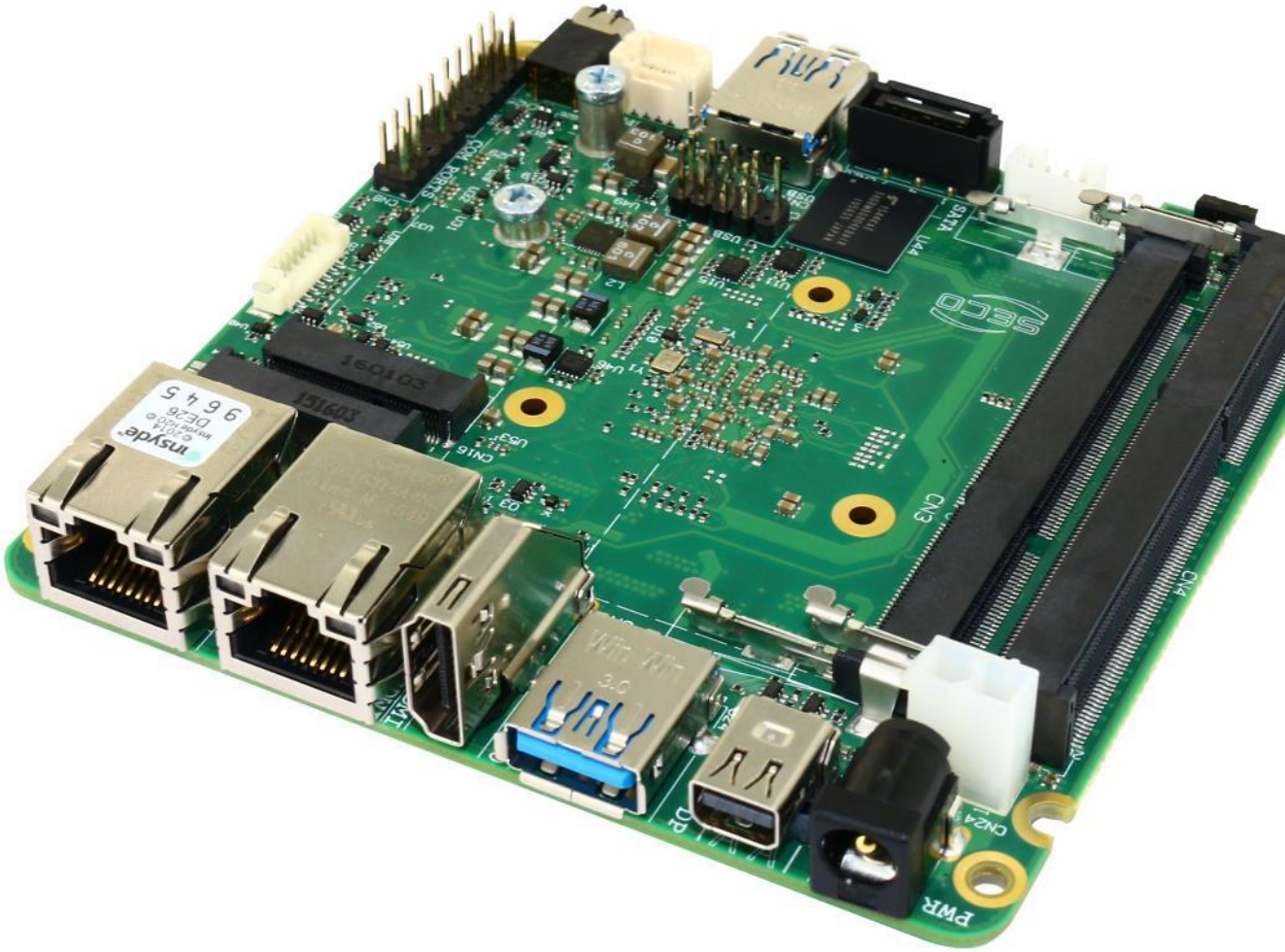
1.8 Reference specifications

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
embedded NUC™	http://www.sget.org/fileadmin/_migrated/content_uploads/SGET_Specification_embedded_NUC_SFF_V100.pdf
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

SBC-A80-eNUC is a Single Board Computer in embedded NUC™ form factor (just 101.6 x 101.6mm) based on the N-Series Intel® Pentium® / Celeron® and x5-Series Atom™ family of System-on-Chips (SoCs) formerly coded as Braswell, a series of Dual / Quad Core SoCs with 64-bit instruction set and very low TDP.

These SoCs embed all the features usually obtained by combination of CPU + platform controller hubs, all in one single IC, which allows, therefore, the system minimisation and performance optimisation, which is essential for boards with sizes so reduced as for embedded NUC™ SBCs.

This single chip solution includes the memory controller, which gives support for up to 8GB of DDR3L-1600 SODIMM Memory.

All SoCs embed an Intel® Gen 8-LP graphic core, 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, the miniDP++ and eDP interfaces. Any combinations of these video interfaces are supported.

Further features, managed directly by the N-Series Intel® Pentium® / Celeron® and x5-Series Atom™ family of SoCs and included in SBC-A80-eNUC 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, five USB ports (two USB 3.0 on standard Type-A sockets, one USB 2.0 on M.2 Socket 1 Key E Connectivity slot and two USB 2.0 on internal pin header), HD Audio, two UARTs (which are made available with software-configurable RS-232 / RS-422 / RS-485 interface) and three PCI Express lanes (two PCI express lanes are used for the implementation of two Gigabit Ethernet interfaces, the other is carried out on M.2 Socket 1 Key E Connectivity slot)

This board is suitable both for IoT applications, due to its rich connectivity, and for industrial applications, since it can accept supply voltages in the range +18V_{DC} ÷ + 32V_{DC} (recommended voltage range).

The board offers the possibility of expansion by using M.2 modules (both for mass storage and connectivity expansion), which is one of the most recent standards for expansion modules. This guarantees to the SBC-A80-eNUC board a wide possibility of expandability even for the future.

Please refer to following chapter for a complete list of all peripherals integrated and 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® Celeron® N3060, Dual Core @1.6GHz (Turbo Boost 2.48GHz), 2MB Cache, 6W TDP
Intel® Celeron® N3010, Dual Core @1.04GHz (Turbo Boost 2.24GHz), 2MB Cache, 4W TDP
Intel® Atom™ x5-E8000, Quad Core @1.04GHz, 2MB Cache, 5W TDP

Memory

Up to 8GB Dual Channel on DDR3L-1600 SO-DIMM Slot *

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
miniDP++ connector
embedded DisplayPort (eDP) internal connector

Video Resolution

HDMI, DP++, resolution up to 3840x2160 24bpp @30Hz, 2560x1600 24bpp @60Hz
eDP, resolution up to 2560x1440 24bpp @60Hz

Mass Storage

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

** 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

2 x USB 3.0 Host ports on Type-A sockets
2 x USB 2.0 Host port on internal pin header
1 x USB 2.0 Host port on M.2 Connectivity slot

PCI-Express

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

Audio

HD Audio Codec Realtek ALC883
Combo TRSS connector with Mic In and Line out support
Audio available on HDMI and miniDP++ interface

Serial Ports

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

Other Interfaces

8 x GPI/Os
I2C Touch Panel connector
Switch/LED Front Panel Header
CIR (Consumer InfraRed) Sensor

Power supply: $+18V_{DC} \div + 32V_{DC}$ recommended
$+15V_{DC} \div +36V_{DC}$ absolute
RTC Battery

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

Dimensions: 101.6 x 101.6 mm (4" x 4").

Supported Operating Systems:

Microsoft® Windows® 7 (32/64 bit)
Microsoft® Windows® 8.1 (32/64 bit)
Microsoft® Windows® 10 (32/64 bit)
Microsoft® Windows® 10 IoT
Microsoft® Windows® Embedded Standard 7 /8 (32/64 bit)
Linux (32/64 bit)

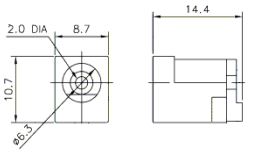
! *** Temperatures indicated are the maximum temperature that the heatspreader / heatsink can reach in any of its parts. This means that it is customer's responsibility to use any passive cooling solution along with an application-dependent cooling system, capable to ensure that the heatspreader / heatsink temperature remains in the range above indicated. Please also check paragraph 5.1*

2.3 Electrical specifications

The SBC-A80-eNUC board can be supplied with any voltage in the range +15V_{DC} ÷ +36V_{DC} (absolute voltage range)

Anyway, it is recommended that the supply voltage be in the +18V_{DC} ÷ +32V_{DC} range (recommended voltage range)

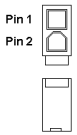
This voltage can be supplied through a standard 6.3mm (internal pin, diameter 2.0 mm) Power Jack (CN24). Internal pin is V_{IN} power line.



Power IN connector - CN23	
Pin	**Signal**
1	GND
2	V_{IN}

As an alternative, the board can be equipped with an internal “mini-Fit” connector, type MOLEX p/n 39-28-1023 or equivalent, which can be used for the connection of an external PSU.

Mating connector: MOLEX p/n 39-01-2020 or equivalent with crimp terminals series 5556/44476.



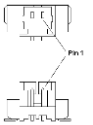
2.3.1 RTC Battery

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 SBC-A80-eNUC are compliant to requirements of European Directive 2006/66/EC regarding batteries and accumulators. When putting out of order SBC-A80-eNUC, 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 SBC-A80-eNUC 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 **+19V$_{DC}$** Notebook DC Adapter.

- O.S. Windows 10 Professional
- 4GB (Transcend p/n TS512MSK64W6H) or 8GB (Transcend p/n TS1GSK64W6H) DDR3L-1600MHz SODIMM
- 16 or 32GB eMMC onboard
- USB mouse and keyboard connected
- HDMI display connected, resolution 1920x1080.
- Optional adapter module for audio jacks, pushbuttons and status LEDs connected.
- Bios Release 1.00 Rc09

Status	SoC / Configuration				
	N3710 32GB eMMC 4GB RAM	N3160 32GB eMMC 8GB RAM	N3060 16GB eMMC 4GB RAM	N3010 16GB eMMC 4GB RAM	x5-E3800
Inrush current at boot	784mA	712mA	880mA	824mA	TBM
Idle, power saving configuration	230mA	190mA	192mA	195mA	TBM
OS Boot, power saving configuration	457mA	360mA	380mA	340mA	TBM
Video reproduction@720p, power saving configuration	285mA	270mA	252mA	270mA	TBM
Video reproduction@1080p, power saving configuration	343mA	333mA	292mA	296mA	TBM
3DMarkVantage benchmark, power saving configuration	720mA	635mA	584mA	545mA	TBM
3DMarkVantage benchmark, maximum performance (RMS value)	761mA	673mA	688mA	504mA	TBM
3DMarkVantage benchmark, maximum performance (peak value)	976mA	992mA	1020mA	736mA	TBM

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

Battery Backup power consumption: 8.6µA
Soft-Off State power consumption: 43.25mA
Suspend State power consumption: 53.60mA

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

Please also consider that the SBC-A80-eNUC board can accept a wide voltage range; the efficiency of the DC/DC converters, necessary to generate all the voltages used by the module itself and by the peripherals connected, varies with the rise of the input voltage.

For all these reasons, it is recommended to use PSU with a minimum voltage of 40W 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.

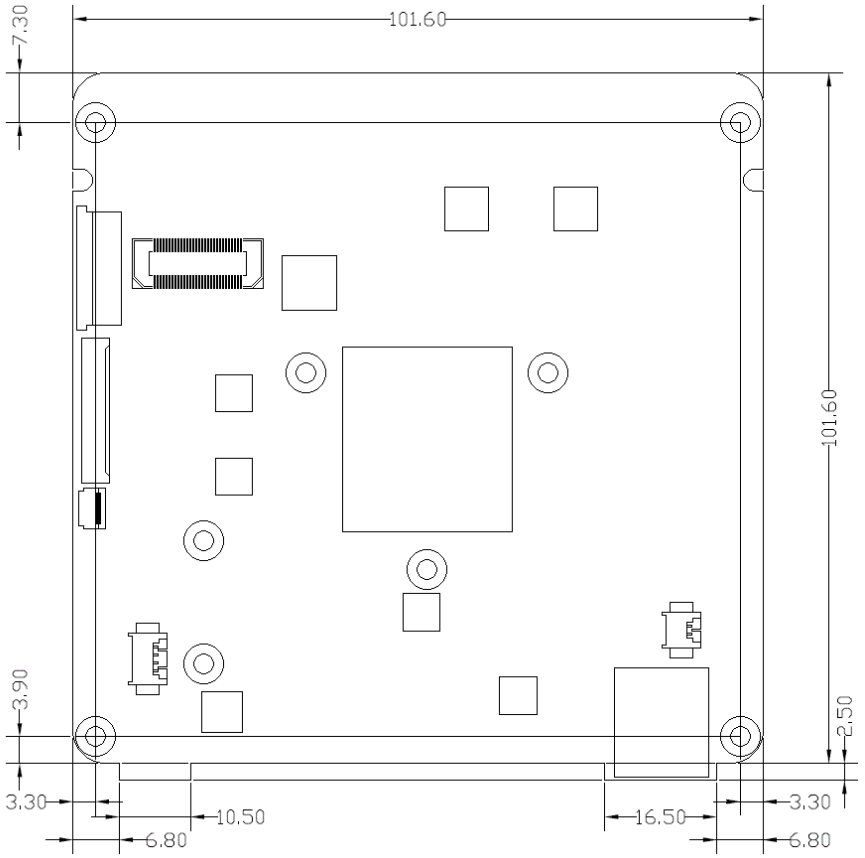
_A: Always-on voltages, i.e. power rails that are active both in ACPI's S0 (Working), S3 (Standby) and S5 (Soft Off) state. Examples: +5V_A, +3.3V_A.

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).

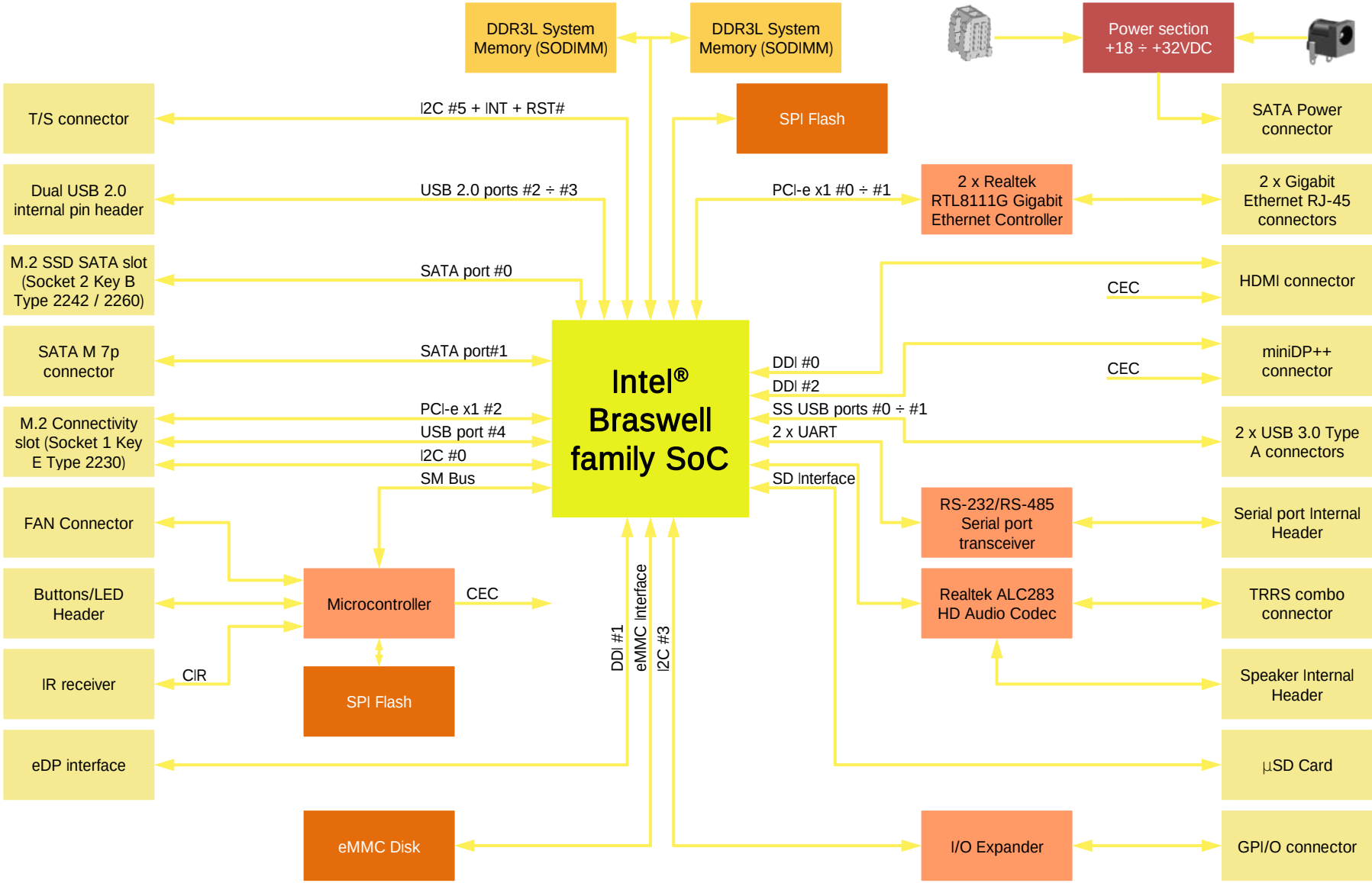
2.4 Mechanical specifications

According to embedded NUC™ form factor, board dimensions are 101.6 x 101.6 mm (4” x 4”).

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

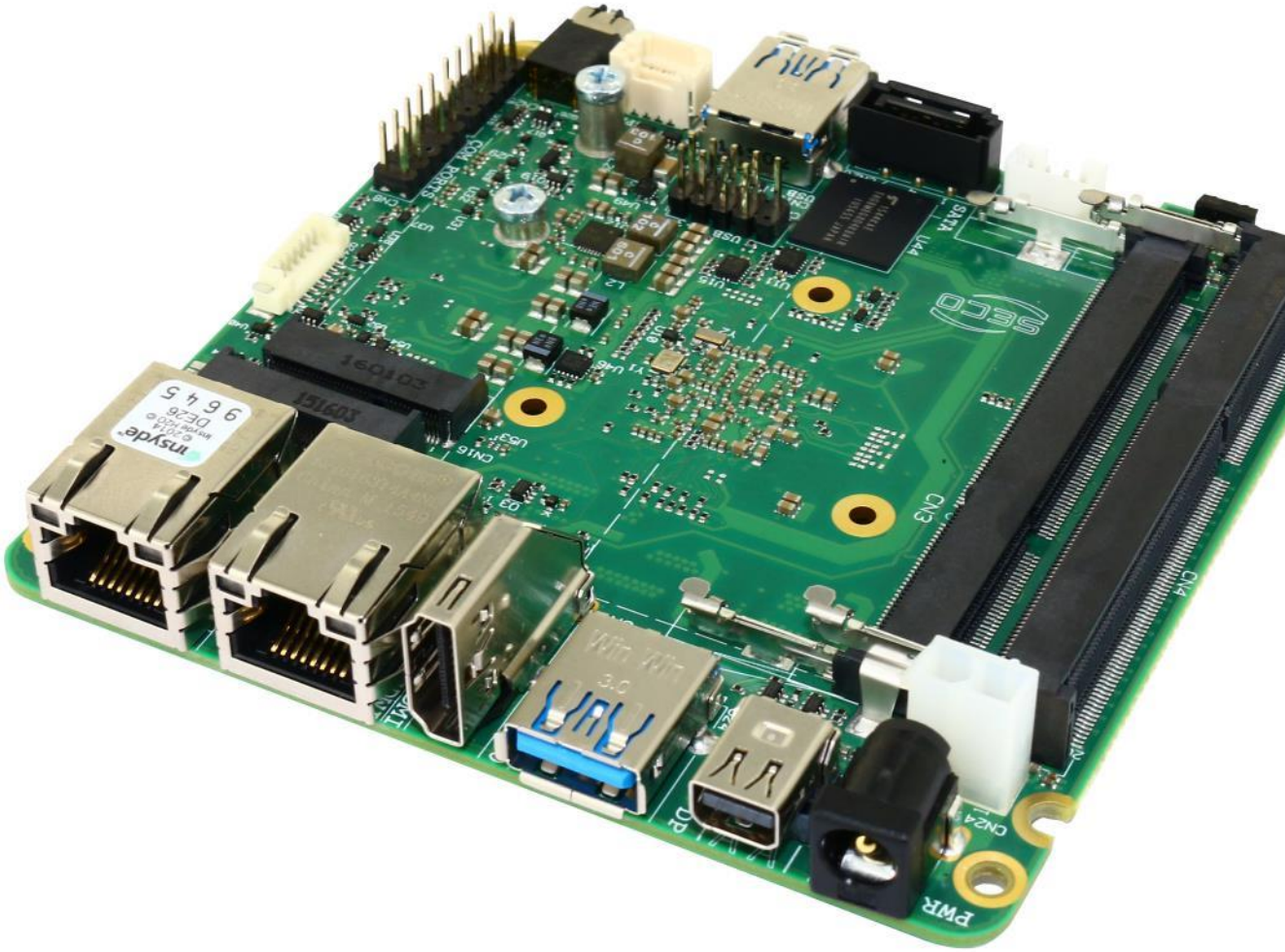


2.5 Block diagram



Chapter 3.
CONNECTORS

- Introduction
- Connectors overview
- Connectors description

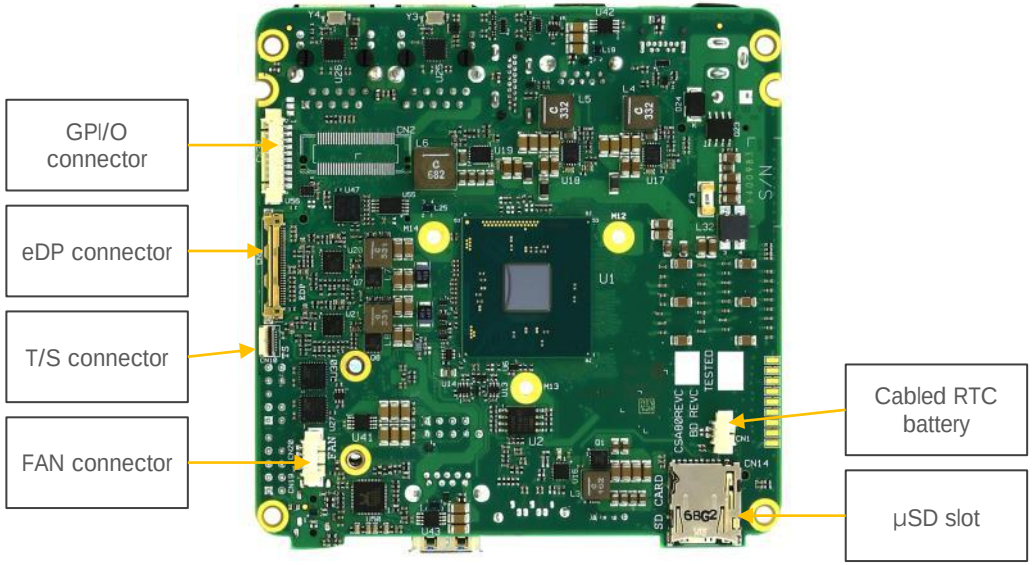


3.1 Introduction

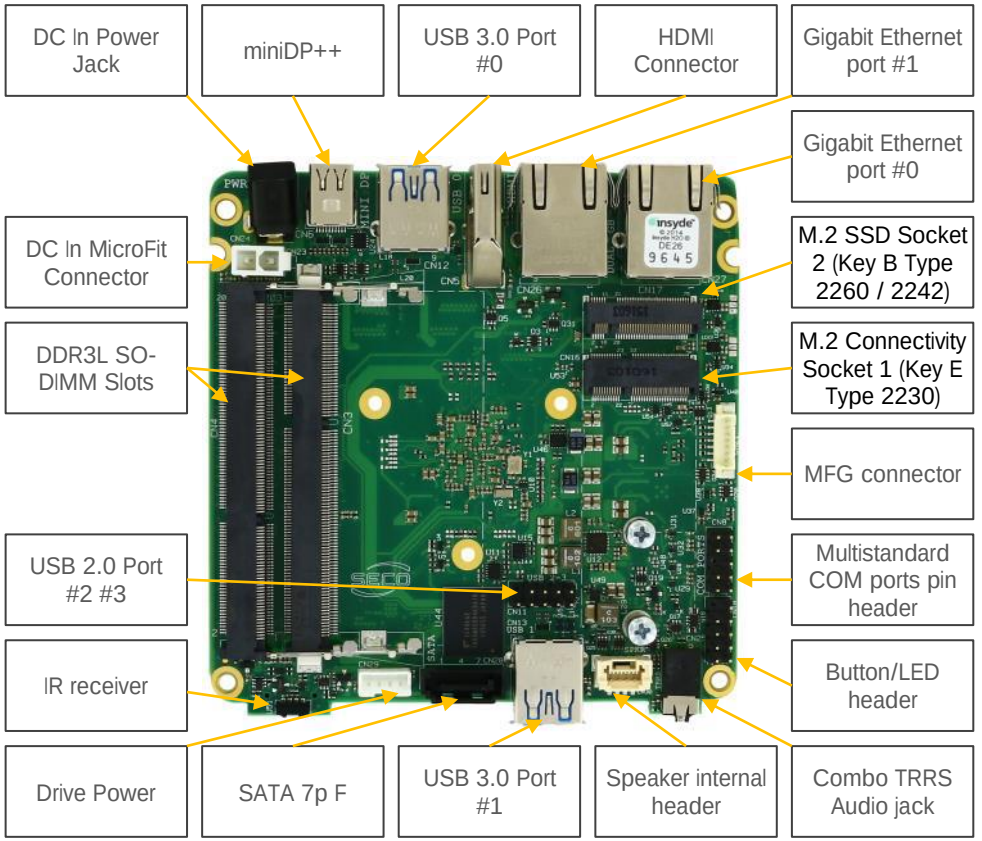
On SBC-A80-eNUC board, there are several connectors located on the upper plane. Standard connectors are placed on the same side of PCB, so that it is possible to place them on a panel of an eventual enclosure.

> **!** 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
CN1	Cabled RTC Battery	CN18	Button/LED Internal Header
CN3	DDR3L SO-DIMM Slot #1	CN19	Optional FAN Header 3p
CN4	DDR3L SO-DIMM Slot #2	CN20	FAN Header 4p
CN5	HDMI connector	CN21	MFG Connector
CN6	miniDP++ connector	CN23	Power IN microFit 2p
CN8	Multistandard COM ports internal header	CN24	DC IN Power Jack
CN9	eDP internal connector	CN25	TRRS Combo Audio Jack
CN10	T/S Controller Internal connector	CN26	Gigabit Ethernet Port #1
CN11	USB 2.0 ports #2 #3 Internal header	CN27	Gigabit Ethernet Port #0
CN12	USB 3.0 Port #0	CN28	SATA Port #1 M 7p connector
CN13	USB 3.0 Port #1	CN29	HDD Power connector
CN14	µSD Card Slot	CN30	Speaker Connector
CN16	M.2 Connectivity Socket 1 (Key E Type 2230)	CN32	GPI/O connector (available only on PCB rev. C or higher)
CN17	M.2 SSD Socket 2 (Key B Type 2260)	U51	IR Receiver

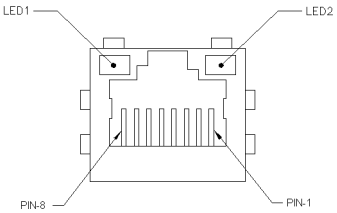
3.3 Connectors description

3.3.1 Ethernet connectors

Gigabit Ethernet Port #0 - CN27			
Pin	**Signal**	**Pin**	**Signal**
1	GBE0_MDI0+	5	GBE0_MDI2-
2	GBE0_MDI0-	6	GBE0_MDI1-
3	GBE0_MDI1+	7	GBE0_MDI3+
4	GBE0_MDI2+	8	GBE0_MDI3-

Gigabit Ethernet Port #1 - CN26			
Pin	**Signal**	**Pin**	**Signal**
1	GBE1_MDI0+	5	GBE1_MDI2-
2	GBE1_MDI0-	6	GBE1_MDI1-
3	GBE1_MDI1+	7	GBE1_MDI3+
4	GBE1_MDI2+	8	GBE1_MDI3-

On board, there are two Gigabit Ethernet connections, for the connection of the SBC-A80-eNUC module to two different Networks.



Both Ethernet connections are managed by as many dedicated Realtek RTL8111G Gigabit Ethernet controllers, interfaced to PCI-express lanes #0 and #1.

On each connector there are also two bicolour Green/Yellow LEDs: LED1 (Left LED) shows 10Mbps, 100Mbps or 1000Mbps connection: green means 100Mbps connection, yellow means 1000Mbps connection, when the LED is Off then 10Mbps or no connection is available. LED2 (Right LED) shows ACTIVITY presence.

These two interfaces are 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 they will work in Gigabit mode only in case that they are 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.

GBEx_MDI0+/GBEx_MDI0-: 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

The Intel® Braswell family of SoCs used on SBC-A80-eNUC 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.

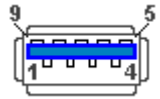
USB 3.0 port#0 type A receptacle - CN12

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+

USB 3.0 port#1 type A receptacle - CN13

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+

The USB 3.0 ports #0 and #1 are available on two single USB connectors, CN12 and CN13, placed on the two opposite sides of the PCB (“Rear” and “Frontal”, considering a possible application of this board with an enclosure). The connectors used are two standard USB 3.0 type-A receptacles.



Since these connectors are standard type-A receptacle, it 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 2.0 ports #2-#3 pin header - CN11

Pin	Signal	Pin	Signal
1	$+5V_{USB2}$	2	$+5V_{USB3}$
3	USB_P2-	4	USB_P3-
5	USB_P2+	6	USB_P3+
7	GND	8	GND
		10	---

Managed by the xHCI Controller, there are also two additional USB 2.0 ports, which are hosted on a 9-pin p2.54mm pin headers ,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_A 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) e the “Wake-Up on USB” functionality.

For the connection of standard devices to this pin headers, it is needed an adapter cable. SECO can optionally provide for such an adapter cable, as a part of the accessory kit p/n CABKITA80 (please check

chapter 5.2.1 for further details).

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; it is managed by xHCI controller.

USB_SSTX1+/USB_SSTX1-: USB Super Speed Port #1 transmit differential pair; it is managed by xHCI controller.

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 SBC-A80-eNUC board.

It is possible to force the 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

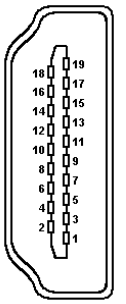
3.3.3 HDMI connector

HDMI Connector - CN5			
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++/eDP modes (eDP mode is supported only on DDI #0 and #1).

On the SBC-A80-eNUC board, the Digital Display Interface #0 is used to implement a HDMI interface.

Therefore, on-board it is available a standard certified HDMI connector, upright, type A, WIN WIN P/N WHDR-19D1BBNU3N.



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 2k2Ω pull-up resistor.

SCL: DDC Clock line for HDMI panel. Output signal, electrical level $+5V_{HDMI}$ with a 2k2Ω 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

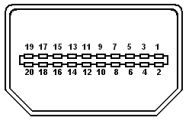
For ESD protection, on all data and voltage lines are placed clamping diodes for voltage transient suppression.

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++ Connector

miniDP++ Connector - CN6			
Pin	**Signal**	**Pin**	**Signal**
1	GND	2	DP_HPD
3	DP_LANE0+	4	CAD
5	DP_LANE0-	6	HDMI_CEC
7	GND	8	GND
9	DP_LANE1+	10	DP_LANE3+
11	DP_LANE1-	12	DP_LANE3-
13	GND	14	GND
15	DP_LANE2+	16	HDMI_CTRL_CLK / DP_AUX+
17	DP_LANE2-	18	HDMI_CTRL_DAT / DP_AUX-
19	GND	20	+3.3V_S

On the SBC-A80-eNUC board, the Digital Display Interface #2 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 a miniDP connector, 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 signal 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:

DP_LANE0+/DP_LANE0-: Display Port differential pair #0.

DP_LANE1+/DP_LANE1-: Display Port differential pair #1.

DP_LANE2+/DP_LANE2-: Display Port differential pair #2.

DP_LANE3+/DP_LANE3-: Display Port differential pair #3.

DP_HPD: Hot Plug Detect Input signal.

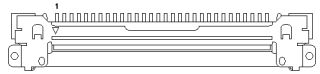
HDMI_CEC: HDMI Consumer Electronics Control (CEC) Line. This signal is used only for HDMI compatibility when a HDMI adapter is connected to the DP connector.

3.3.5 eDP Connector

eDP connector - CN9	
Pin nr.	**Pin name**
1	N.C.
2	SW_BACK
3	SW_BACK
4	SW_BACK
5	SW_BACK
6	N.C.
7	N.C.
8	eDP_BLT_CTRL
9	eDP_BACKLIGHT_EN
10	GND
11	GND
12	GND
13	GND
14	eDP_HPD
15	GND
16	GND
17	N.C.
18	SW_VDD
19	SW_VDD
20	GND
21	eDP_AUX-
22	eDP_AUX+
23	GND
24	eDP_TX0+
25	eDP_TX0-
26	GND
27	eDP_TX1+
28	eDP_TX1-
29	GND
30	N.C.

On the SBC-A80-eNUC board, the Digital Display Interface #1 is reserved for the connection of LCD panels having an embedded Display Port interface.

For the connection of this kind of displays, on-board there is a VESA® certified connectors for Display Port interface, type I-PEX p/n 20455-030E-02.



Mating connector: I-PEX p/n 20454-030T.

On this connector, SW_BACK and SW_VDD are the voltage rails that can be used to supply the LCD and related Backlight Unit.

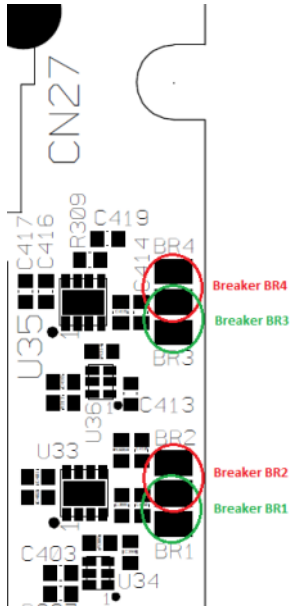
Breaker closed	SW_VDD Voltage
BR4	+5V_A
BR3	+3.3V_A

The LCD software-driven voltage, i.e. signal SW_VDD, can be regulated to be connected to +3.3V_A or +5V_A by closing (short-circuiting) breakers BR3 **or** BR4, respectively (only one breaker at a time, otherwise there will be a short circuit between the two different voltages).

Breaker closed	SW_BACK Voltage
BR2	+12V_A
BR1	+5V_A

Similarly, the backlight software-driven voltage, i.e. signal SW_BACK, can also be regulated to be connected to +5V_A or +12V_A by closing (short-circuiting) breakers BR1 **or** BR2, respectively (only one breaker at a time, otherwise there will be a short circuit between the two different voltages).

Please refer to the figure on the left for an indication of the placement on the PCB of the four breakers mentioned above (they are located on the bottom side, near connector CN27).



Please take care of closing only one breaker per voltage rail (i.e., BR1 **or** BR2, BR3 **or** BR4), otherwise there will be short circuits between the main power rails of the board.

Upon specific request, the board can be supplied configured with the desired voltages already set. Please contact your Sales Representative for details about this.

Here following the signals involved in eDP management:

eDP0_TX0+/eDP0_TX0-: embedded DP differential data pair #0.

eDP0_TX1+/eDP0_TX1-: embedded DP differential data pair #1.

eDP0_AUX+/eDP0_AUX-: embedded DP auxiliary channel differential data pair.

eDP_HPD: embedded DP Hot Plug Detect. Active high signal with 100kΩ pull-down resistor

eDP_BACKLIGHT_EN: +3.3V_A electrical level Output, 100kΩ pull-down resistor, Backlight Enable signal. It can be used to turn On/Off the backlight's lamps of connected displays.

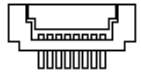
eDP_BLT_CTRL: this signal can be used to adjust the backlight brightness in displays supporting Pulse Width Modulated (PWM) regulations (+3.3V_A electrical level, 100kΩ pull-down resistor).

3.3.6 T/S connector

T/S connector - CN10	
Pin	**Signal**
1	+3.3V_A
2	GND
3	GND
4	TOUCH_RST#
5	TOUCH_INT#
6	TOUCH_SCL
7	GND
8	TOUCH_SDA

It is possible to connect an external I2C Touch screen connector to the SBC-A80-eNUC board.

For this purpose, a dedicated 8-pin FFC Connector, Type HIROSE p/n FH34S-8S-0.5SH(50) or equivalent is provided.



This connector mates with 0.5mm pitch 8-poles FFC cables.

Here following the signals related to Touch Screen management:

TOUCH_SCL: I2C Bus clock line. Bidirectional signal, electrical level +3.3V_A with a 2K2Ω pull-up resistor. It is managed by SoC's I2C controller #5.

TOUCH_SDA: I2C Bus data line. Bidirectional signal, electrical level +3.3V_A with a 2K2Ω pull-up resistor. It is managed by SoC's I2C controller #5.

TOUCH_RST#: Reset, active low signal, +3.3V_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 (SATA_GP2 signal of the N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs).

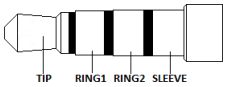
TOUCH_INT#: +3.3V_A electrical level input with 100kΩ pull-up resistor. This signal can be used to serve the interrupt request of an eventual external Touch Screen connected to the dedicated I2C interface. It is also possible to use this signal as a GPIO (SATA_GP1 signal of the N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs).

3.3.7 Audio interfaces

In the SBC-A80-eNUC board, audio functionalities are provided by a Realtek ALC283 High Definition Audio Codec.

TRRS Audio jack- CN25	
Pin	**Signal**
TIP	Headphone Out Left Channel
RING1	Headphone Out Right Channel
RING2	GND
SLEEVE	MIC_IN

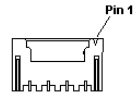
In order to reduce the space dedicated to connectors, there is a TRRS Combo Audio Jack, i.e. a single jack which offer both stereo Line Out and Mic In functionalities.



Such TRRS Combo Audio jack 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.

Speaker Connector- CN30	
Pin	**Signal**
1	Speaker Right Channel +
2	Speaker Right Channel -
3	Speaker Left Channel -
4	Speaker Left Channel +

Additionally, it is also possible to connect external stereo speakers by using the dedicated connector CN30, which is a connector type JST p/n BM04B-ZESS-TB.



Mating connector: JST ZER-04V-S with SZE-002T-P0.3female crimp terminals.

SECO can provide for an adapter cable to this connector as a part of the accessory kit p/n CABKITA80 (please check chapter 5.2.1 for further details).

Speaker audio output is internally amplified and supports 8Ω speakers only.

3.3.8 Buttons / LED header

Buttons / LED Header - CN18			
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 SBC-A80-eNUC 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 CN18 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.

It is possible to buy SECO's dedicated front panel module, which offers standard connections: two standard audio jacks, two pushbuttons (for reset and power on) and two LEDs, for SATA activity and Power status signaling.

This adapter module is also contained inside the dedicated cable kit (CABKITA80) for SBC-A80-eNUC board. Please also check chapter 5.2.1for further details.

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 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 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.

3.3.9 Multi-standard serial ports

Dual RS-232/RS-422/RS-485 pin header- CN8			
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-	

The N-series Intel® Pentium® / Celeron® and the x5-Series Atom™ SoCs embed two high speed UART controllers, which support COM ports with flow control (RTS# and CTS# signals).

These two ports are carried, on SBC-A80-eNUC board to as many multistandard RS-23/RS-422/RS-485 transceivers, allowing the implementation of two multistandard serial ports.

These ports are available on dedicated connector CN8, 

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

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 check par. 4.3.4.3).

Please be aware that for proper RS-485 working, the RTS# signals coming out from the N-series Intel® Pentium® / Celeron® and x5-Series Atom™ SoCs must be used as an 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.

For Debug Purposes, COM2_TxD and COM2_RxD signals can be switched with Debug UART (PCU UART) Tx and Rx signals, respectively. This is possible, however, only when the UART #2 is disabled. In this case, the Debug UART (which can work exclusively in RS-232 mode) can be enabled, and it will be available

on connector CN8, pins 2 and 4.

Please check paragraphs 4.3.4.3, 4.3.4.4 and 4.3.7 for further details on serial ports enabling and console redirection

3.3.10 µSD slot

The SoCs used on SBC-A80-eNUC 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.

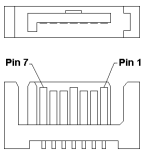
This SD interface is carried to a standard µSD card slot, soldered on top side of the module, push-push type.

3.3.11 S-ATA connectors

S-ATA Connector - CN28	
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, CN28 (the other SATA channel is available on the M.2 KeyB socket, CN17, please check par. 3.3.12).



Here following the signals related to SATA interface:

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

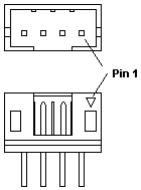
SATA1_RX+/SATA1_RX-: Serial ATA Channel #1 Receive differential pair

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

S-ATA Power Connector - CN21	
Pin	**Signal**
1	+12V_S
2	GND
3	GND
4	+5V_S

A dedicated power connector, CN21, 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 MOLEX p/n 89400-0420 or equivalent, with pinout shown in the table on the left.



Mating connector: MOLEX 87369-0400 crimp housing with MOLEX 50212 crimp terminals.

An adapter cable for powering SATA disks from this connector is also contained inside the dedicated cable kit (CABKITA80) for SBC-A80-eNUC board. Please also check chapter 5.2.1for further details.

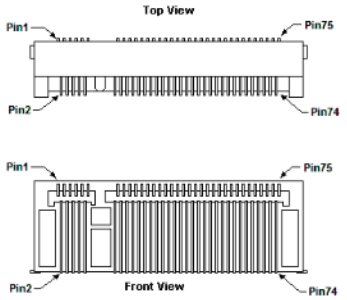
3.3.12 M.2 SSD Slot: Socket 2 Key B

M.2 SSD Slot (Socket 2 Key B type 2242 /2260- CN17)			
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	---	30	---
31	---	32	---
33	GND	34	---
35	---	36	---
37	---	38	---
39	GND	40	---
41	SATA0_RX+	42	---
43	SATA0_RX-	44	---
45	GND	46	---
47	SATA0_TX-	48	---
49	SATA0_TX+	50	---
51	GND	52	---
53	---	54	---
55	---	56	---
57	GND	58	---

The mass storage capabilities of the SBC-A80-eNUC are completed by an M.2 SSD Slot, which allow plugging M.2 Socket 2 Key B Solid State Drives.

The connector used for the M.2 SSD slot is CN17, 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-A80-eNUC board there is also a Threaded Spacer which allows the placement of M.2 Socket 2 Key B SSD modules in 2260 size.



It is possible to place also modules in 2242size, by using a M/F Spacer which allow fixing the M.2 SSD 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 this SATA interface:

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

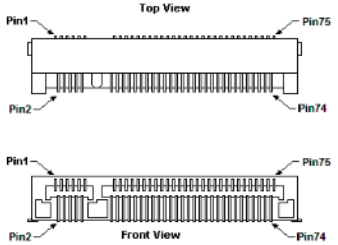
SATA0_RX+/SATA0_RX-: Serial ATA Channel #0 Receive differential pair

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

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

3.3.13 M.2 Connectivity Slot: Key E Socket 1

M.2 Connectivity Slot: Socket 1 Key E type 2230 - CN16			
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	PCIe2_Tx+	36	---
37	PCIe2_Tx-	38	---
39	GND	40	---
41	PCIe2_Rx+	42	---
43	PCIe2_Rx-	44	---
45	GND	46	---
47	PCIe2_CLK+	48	---
49	PCIe2_CLK-	50	SUS_CLK
51	GND	52	PLT_RST#
53	PCIe_REQ2#	54	BT_DISABLE#
55	M.2_WAKE#	56	WIFI_DISABLE
57	GND	58	M.2_I2C_SDA



It is possible to increase the connectivity of the SBC-A80-eNUC board by using M.2 Socket 1 Key E connectivity modules.

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

On the SBC-A80-eNUC 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.

PCIe2_TX+/PCIe2_TX-: PCI Express lane #2, Transmitting Output Differential pair

PCIe2_RX+/PCIe2_RX-: PCI Express lane #2, Receiving Input Differential pair

PCIe2_Clock+ / PCIe2_Clock-: PCI Express Reference Clock for lane #2, Differential Pair

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

PLT_RST#: Reset Signal that is sent from the SoC to all PCI-e devices available on the board (i.e. the GbE controllers) and on the connectivity module. It is a 3.3V active-low signal.

PCIe_REQ2#: 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 SBC-A80-eNUC 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 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 BIOS (see par. 4.5, "WiFi on M.2")

59	---	60	M.2_I2C_SCL
61	---	62	M.2_ALERT#
63	GND	64	---
65	---	66	---
67	---	68	---
69	GND	70	---
71	---	72	+3.3V_A
73	---	74	+3.3V_A
75	GND		

M.2_I2C_SDA: I2C Bus data line. Bidirectional signal, electrical level +3.3V_A with a 2K2Ω pull-up resistor. It is managed by SoC's I2C controller #0.

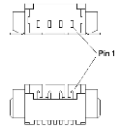
M.2_I2C_SCL: I2C Bus clock line. Bidirectional signal, electrical level +3.3V_A with a 2K2Ω pull-up resistor. It is managed by SoC's I2C controller #0.

M.2_ALERT#: I2C Bus Alert. Input signal, electrical level +3.3V_A with a 100KΩ pull-up resistor. It is managed by SoC's SM Bus Alert Signal. This signal is connected only on boards with PCB rev. C and greater

3.3.14 FAN connectors

FAN Connector - CN20	
Pin	**Signal**
1	GND
2	FAN_POWER
3	FAN_TACHO_IN
4	FAN_PWM

Depending on the usage model of SBC-A80-eNUC, for critical applications/environments on SBC-A80-eNUC it is available a 4-pin dedicated connector for an external +12V_{DC} FAN.



The default FAN Connector is a 4-pin single line SMT connector, type MOLEX 53261-0471 or equivalent, with pinout shown in the table on the left.

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

Optional FAN Connector - CN21	
Pin	**Signal**
1	GND
2	FAN_POWER
3	FAN_TACHO_IN

Alternatively, as a factory option, the SBC-A80-eNUC module can be equipped with 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.

Please refer to chapter 5.1 for considerations about thermal dissipation.

FAN_POWER: +12V_A derived power rail for FAN.

FAN_PWM: PWM output from the embedded microcontroller to the FAN (4-pin connector only).

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

3.3.15 GPI/O connector

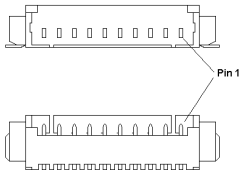
Interfaced to the I2C interface #3 coming from the Intel® Braswell family of SoCs, there is a device, NXP Semiconductors PCAL6408A, which is able to provide 8 General Purpose I/O pins. The device allows for a wide configurability of GPI/O pins, since it can offer programmable output drive strength, latchable inputs, programmable pull-up/pull-down resistors, maskable interrupt, interrupt status register, programmable open-drain or push-pull outputs.

GPI/O connector – CN32			
Pin	**Signal**	**Pin**	**Signal**
1	VDD_GPIO	6	GPIO_4
2	GPIO_0	7	GPIO_5
3	GPIO_1	8	GPIO_6
4	GPIO_2	9	GPIO_7
5	GPIO_3	10	GND

The device acts as a slave according to I2C protocol, and can be addressed at address 0100000 binary.

It is possible to select the voltage reference level of these GPI/Os, which can be adjusted to be referred to +3.3V_A or to +5V_A voltage.

Access to these extended I/O comes through a10-pin single line SMT connector, type MOLEX 53261-1071 or equivalent, with pinout shown in the table on the left.

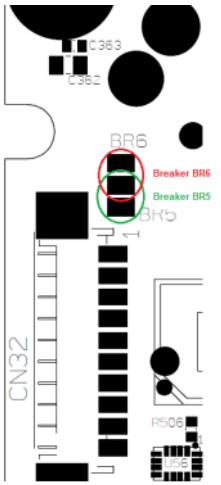


Mating connector: MOLEX 51021-1000 receptacle with MOLEX 50079-8000 female crimp terminals.

GPIO_[0..7]: I/O Expander Port P Input/Output [0..7]

VDD_GPIO: Supply voltage for I/O Expander Port P. This voltage can be regulated to be connected to +3.3V_A or +5V_A by closing (short-circuiting) breakers BR5 **or** BR6, respectively (only one breaker at a time, otherwise there will be a short circuit between the two different voltages).

Please refer to the figure on the right for an indication of the placement on the P.CB of the two breakers mentioned above (they are located on the top side, near connector CN32).



Please take care of closing only one breaker per voltage rail (i.e., BR5 **or** BR6), otherwise there will be short circuits between the main power rails of the board.

Upon specific request, the board can be supplied configured with the desired voltages already set. Please contact your Sales Representative for details about this.

> **!** Please be aware that GPI/O connector CN32 is available only on boards with PCB revision C or higher.

3.3.16 SO-DIMM DDR3L Slot

The SBC-A80-eNUC board supports SO-DIMM DDR3L memories up to 1600MHz.

For use of these memories, on board there are two SO-DIMM DDR3L socket.

CN3 is type LOTES p/n AAA-DDR-109-K01 or equivalent, a right angle, high profile socket, h = 5.2mm.

CN4 is type LOTES p/n AAA-DDR-112-K01 or equivalent, a right angle, high profile socket, reverse type, h = 9.2mm.

Both of them are usually used for high speed system memory applications.

3.3.17 IR Receiver

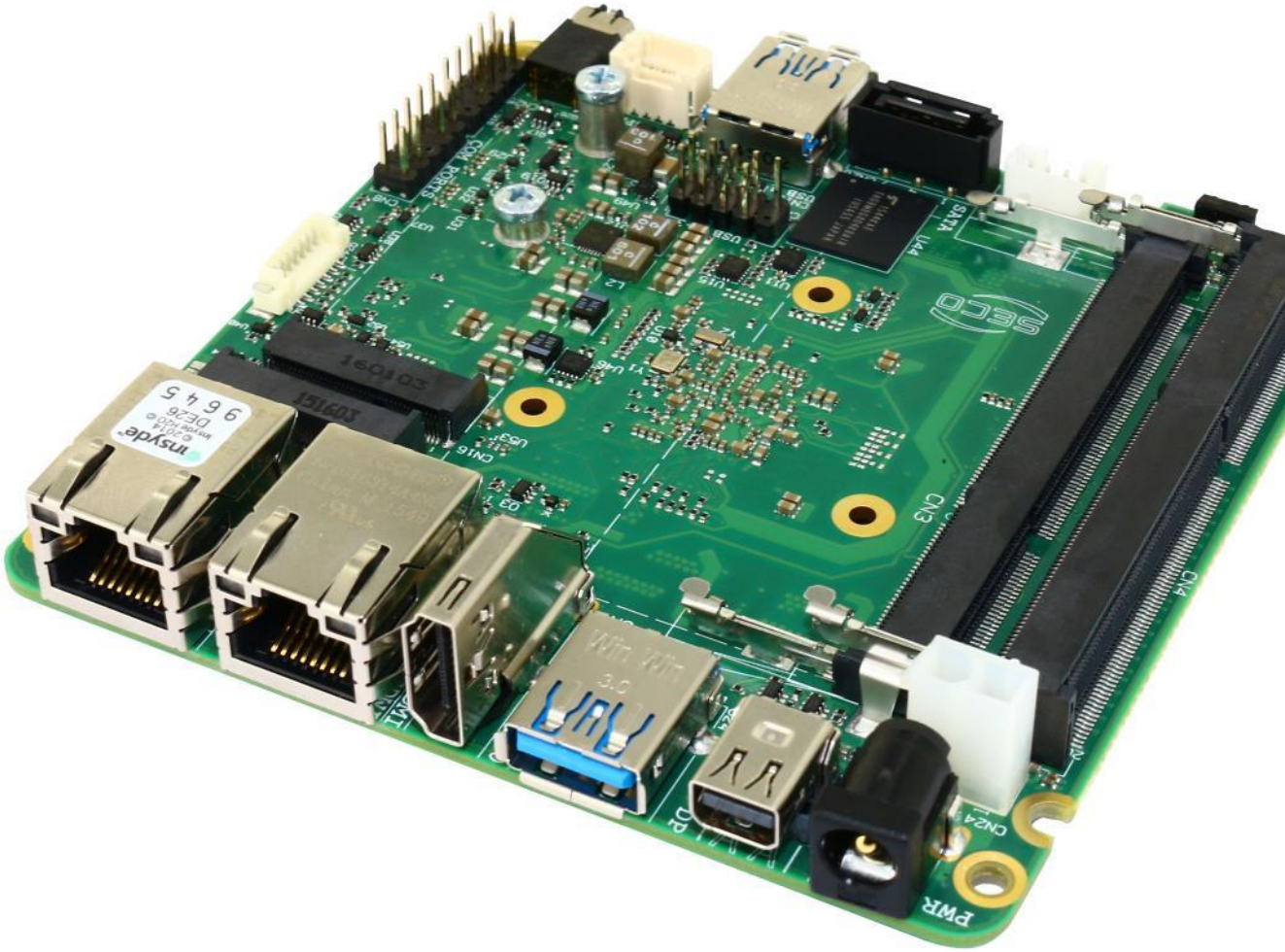
The SBC-A80-eNUC board embeds an IR receiver, which allows using a remote control when the board is placed in an enclosure (like, i.e., on Set Top Boxes).

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.
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> 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, 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 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 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
Android	See submenu	
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 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
eDP	Disabled / Enabled	Enables or disables the eDP video port
HDMI	Disabled / Enabled	Enable / Disable the HDMI video port
Mini Display Port	Disabled / Enabled	Enable / Disable the miniDP video port
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 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 /	Allows enabling the hardware acceleration of decoding of Protected Audio Video streams.

	SERPENT Mode	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
Backlight Control Mode	PWM-Normal PWM-Inverted	This option allows selecting if PWM control of the backlight must be with normal or inverted polarity.
Force Backlight VDD	Disabled / Enabled	When Enabled, the panel backlight is forced to on

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 Rear Panel)	Disabled / Enabled	Enable / Disable USB Port #0, which is available on USB 3.0 connector in Rear Panel Side (CN12)
Port#1 (USB3.0 Front Panel)	Disabled / Enabled	Enable / Disable USB Port #1, which is available on USB 3.0 connector in Front Panel Side (CN13)
Port#2 (USB2.0 Internal Header)	Disabled / Enabled	Enable / Disable USB Port #2, which is available on USB 2.0 internal pin header CN11
Port#3 (USB2.0 Internal Header)	Disabled / Enabled	Enable / Disable USB Port #3, which is available on USB 2.0 internal pin header CN11
Port#4 (USB2.0 M.2 Type 2230 CN16)	Disabled / Enabled	Enable / Disable USB Port #4, which is available on M.2 Type 2230 internal slot CN16

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 HAD 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 SCC 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 CN8
HSUART #1 Interface	RS-232 / RS-422 / RS-485	Can be changed only when "LPSS HSUART #1 Support" is Enabled. Allows to select the interface type of UART #1
HSUART #2	Disabled / Enabled	Can be changed only when "LPSS DMA #1 Support" is not Disabled. Enable / Disable the UART interface #2 available on connector CN8
HSUART #2 Interface	RS-232 / RS-422 / RS-485	Can be changed only when "LPSS HSUART #2 Support" is Enabled. Allows to select the interface type of UART #2
DMA #2 Support	Disabled / Enabled (PCI) / Enabled (ACPI)	Allows to enable second DMA Channel, which onboard is used to support the I2C Channel
I2C #1- M.2 TYPE 2230 CN16	Disabled / Enabled	Can be changed only when "DMA #2 Support" is not Disabled. Enable / Disable the I2C interface available on M.2 Type 2230 Slot (CN16)
I2C #2 - GPIO Expander	Disabled / Enabled	Can be changed only when "DMA #2 Support" is not Disabled. Enable / Disable the I2C interface used to manage the GPIO Expander
I2C #3 - Touch Controller	Disabled / Enabled	Can be changed only when "DMA #2 Support" is not Disabled. Enable / Disable the I2C interface available on Touch Screen Connector (CN10)

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 BIOS SPI region write protect.

4.3.4.5 PCI Express configuration submenu

Menu Item	Options	Description
PCI Express Port 1 (Int. LAN1 on CN27) PCI Express Port 2 (Int. LAN2 on CN26) PCI Express Port 3 (M.2 CN16)	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 #2 PCI Express Root Port #3	Disabled / Enabled	Enable or Disable single PCI Express Root Port #x. PCI Express Root Port #1 ÷ #2 are internally connected to Intel® Gigabit Ethernet Controllers I210. Disabling this port will result in disabling corresponding Ethernet interfaces.
PCI Express 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). When enabled, each port will offer the following menu item
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 submenus of the following paragraph 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	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. 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 CN16
Bluetooth on M.2	Enabled / Disabled	Enables or disables the BT capabilities of BlueTooth cards plugged into M.2 slot CN16
Instant OFF	Enabled / Disabled	In non-ACPI environments, this item will enable the system shut-down by a power button pressure.
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]	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/ 3 / 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 BIOS before starting OS loading.
Turbo Mode	Auto / 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	Select the highest temperature above which the onboard fan must work always at Full Speed
AC1 Temperature (°C)	Disabled / 55 / 60 / 65 / 70 / 75 / 80 / 85 / 90 / 95 / 100 / 105 / 110 / 115	Select the lowest temperature under which the onboard fan must be OFF.
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.
FAN Connector	3 pins / 4 pins	Use this item to set the FAN Connector type.

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 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

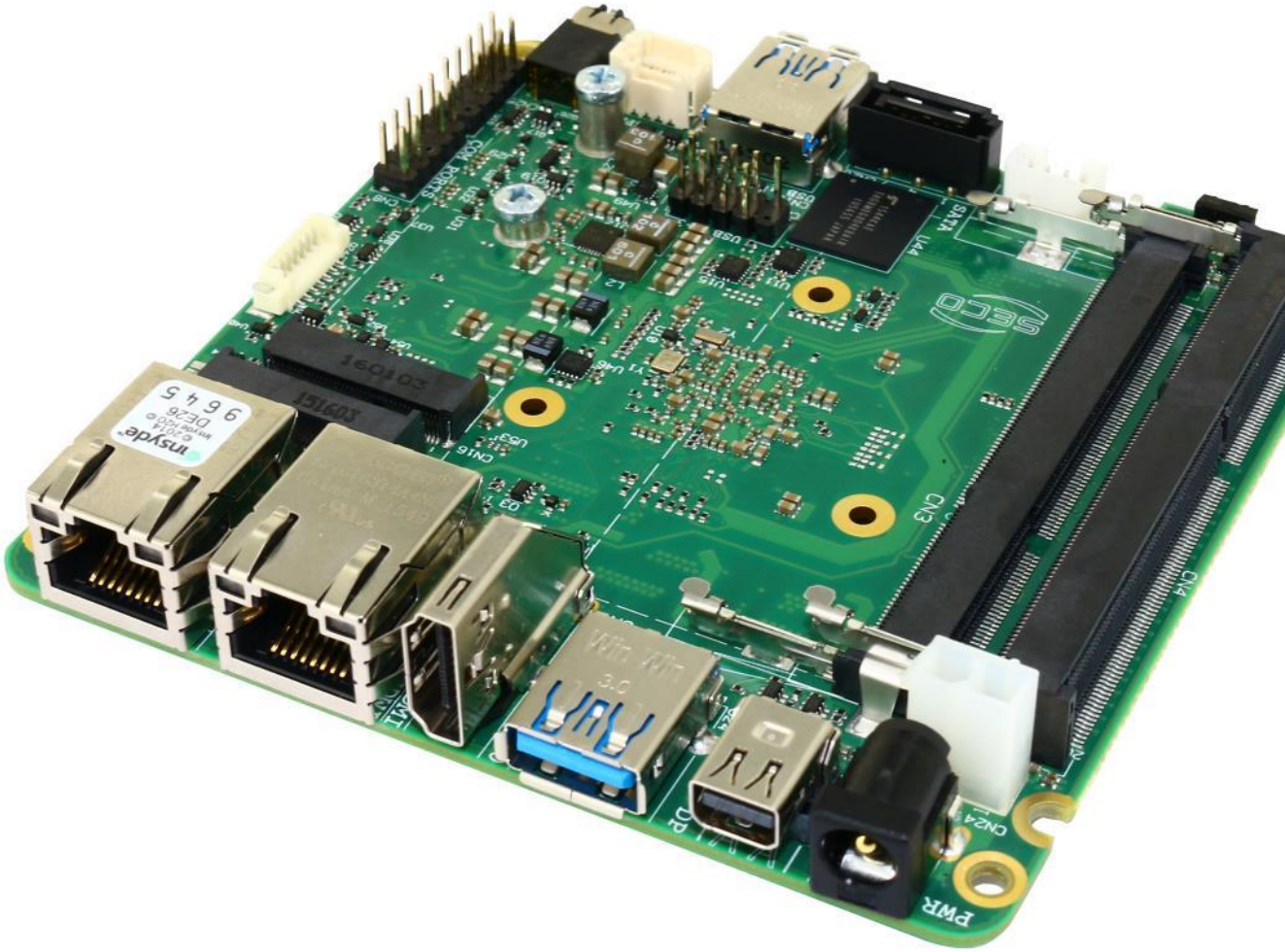
Menu Item	Options	Description
Boot Menu	Normal / Advance	When set to Normal, this submenu will allow configuring all possible options for Legacy boot. When set to Advance, it will be possible to configure Boot Order only for bootable devices found in the system
Boot Type Order	Floppy Drive / Hard Disk 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

- 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 SBC-A80-eNUC 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.

The board can be used along with specific heatspreaders, but please remember that they will act only as thermal coupling device between the board itself and an external dissipating surface/cooler. The heatspreader also needs to be thermally coupled to all the heat generating surfaces using a thermal gap pad, which will optimize the heat exchange between the module and the heatspreader.

The heatspreader is not intended to be a cooling system by itself, but only as means for transferring heat to another surface/cooler, like heatsinks, fans, heat pipes and so on.

When using SBC-A80-eNUC boards, it is necessary to consider carefully the heat generated by the module in the assembled final system, and the scenario of utilization.

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

SECO can provide SBC-A80-eNUC specific heatspreaders, passive heatsinks and heatsinks with fan, but please remember that their use must be evaluated accurately inside the final system, and that they should be used only as a part of a more comprehensive ad-hoc cooling solutions.

The customer shall always ensure that the heatspreader/heatsink surface temperature remains in the range 0 ÷ 60 °C.

Ordering Code	Description
SA80-DISS-1	SBC-A80-eNUC Heatspreader Kit

5.2 Accessories

SECO can offer various accessories in completion of SBC-A80-eNUC functionalities

5.2.1 Accessories kit CABKITA80

This accessories kit includes the following items

- *Dual USB 2.0 Type A adapter with standard PC mounting plate*. Can be used to carry out the signals of internal USB ports #2-#3 (connector CN11) to standard USB 2.0 Type A receptacles
- *Front Panel I/O board* V995, which allows the integration on a panel of an optional enclosure of two Audio jacks (Earphone and Mic in), Reset Button, Power button and two LED (for SATA activity and Power Status of the board itself).

For fixing of the front panel I/O board to the external enclosure's panel, the module is equipped with two brackets and screws for the fixing of the brackets to the module.

- Cables for connection of the Front Panel I/O board to SBC-A80-eNUC board.

Connection cable CV-837/30 is needed for audio functionalities; it is not used with SBC-A80-eNUC board.

Connection cable CV-836/30 is needed for connection of power and reset pushbuttons and SATA / power LEDs; it has to be connected to SBC-A80-eNUC board's connector CN18 and to V995 module's connector CN1.

- Serial adapter cable CV-904/20. It can be used to carry out the signals of RS-232/RS-422/RS-485 signals available on the connector CN8 to two standard DB-9 male connectors.
- SATA power cable, for connection of power rails of external SATA disks / SSDs to internal SATA power connector CN29.
- Speaker connection cable, for the connection of external 8Ω Speaker (not part of the cable itself)

5.2.2 USB-to-Serial port converter modules

This optional module has been designed to convert one of the internal USB ports available on connector CN11 into a serial port, which can be of RS-232, RS-422 or RS-485 type (fixed configuration).

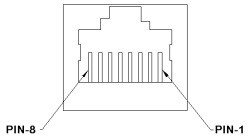
Depending on the type of serial port needed, different module configurations are available; moreover, the output of the module can be available on standard DB-9 male connector or on RJ-45 sockets.

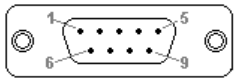
All modules type mounts an FTDI FT232R USB-to-Serial UART interface IC; RS-232 converter module then mounts a Serial Port RS-232 Transceiver with 15kV ESD protection. Instead, the other converters mount and RS-485/RS-422 transceiver.

Modules with DB-9 connector				Modules with RJ-45 socket			
Pin	Signal RS-232 converter	Signal RS-422 converter	Signal RS-485 converter	Pin	Signal RS-232 converter	Signal RS-422 converter	Signal RS-485 converter
1	DCD#	N.C.	N.C.	1	DTR#	N.C.	N.C.
2	RX	RX-	N.C.	2	CTS#	RX+	N.C.
3	TX	TX-	RX- / TX-	3	N.C.	N.C.	N.C.
4	DTR#	N.C.	N.C.	4	RX	RX-	N.C.
5	GND	GND	GND	5	N.C.	N.C.	N.C.
6	DSR#	N.C.	N.C.	6	TX	TX-	RX- / TX-
7	RTS#	TX+	RX+ / TX+	7	GND	GND	GND
8	CTS#	RX+	N.C.	8	RTS#	TX+	RX+ / TX+
9	RI#	N.C	N.C.				

In the table on the left are shown the pinout of DB-9 connector and of RJ-45 socket for all kind of modules.

120Ω termination resistors on differential pairs are available both on RS-422 and on RS-485 modules.





Ordering Code	Description
VA13-0000-1100-C0	USB to RS232 serial port converter with DB9 connector
VA13-0000-1200-C0	USB to RS422 serial port converter with DB9 connector
VA13-0000-1300-C0	USB to RS485 serial port converter with DB9 connector
VA13-0000-2100-C0	USB to RS232 serial port converter with RJ-45 connector
VA13-0000-2200-C0	USB to RS422 serial port converter with RJ-45 connector
VA13-0000-2300-C0	USB to RS485 serial port converter with RJ-45 connector

SECO Srl - Via Calamandrei 91
52100 Arezzo - ITALY
Ph: +39 0575 26979 - Fax: +39 0575 350210
www.seco.com