

COMe-cVR6

User Guide Rev. 1.95

Doc. ID: 1064-6276

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 COME-CVR6 – USER GUIDE

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CAUTION

Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled. Please follow the "General Safety Instructions" supplied with the system.

NOTICE

You find the most recent version of the "General Safety Instructions" online in the download area of this product.

NOTICE

This product is not suited for storage or operation in corrosive environments, in particular under exposure to sulfur and chlorine and their compounds. For information on how to harden electronics and mechanics against these stress conditions, contact Kontron Support.

Revision History

Revision	Brief Description of Changes	Date of Issue	Author
1.0	Initial Issue	2019-December-11	hjs
1.1	Figure 9: X1A and X1B COMe Interface Connectors modified	2020-February-06	hjs
1.2	new memory PNs	2020-March-09	hjs
1.3	Dual memory banks issue	2020-April-07	hjs
1.4	COM.0 Rev 3.0 in chapter 8.1 corrected	2020-April-22	hjs
1.5	Changed Note in Table 14: Display Interfaces	2020-May-05	hjs
1.6	new UL reports in Table 58	2020-May-28	hjs
1.7	Accessories change in Table 4: new 38116-0000-00-5, ADAS removed	2020-July-22	hjs
1.8	wrong processor name in Table 9, max memory size changed in Table 9	2020-October-21	hjs
1.9	DMCM removed	2020-December-02	hjs
1.91	Starter Kit in Table 5 removed, new address	2020-December-15	hjs
1.92	Word2016 issues	2021-March-22	hjs
1.93	New coolers in Table 6: General Accessories	2022-May-19	hjs
1.94	New Ethernet adapter I210, new block diagram in Figure 2	2022-July-26	hjs
1.95	GPIO Update Chapter 7.7	2022-Aug-01	CW

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For contact information, refer to the corporate offices contact information on the last page of this user guide or visit our website [CONTACT US](#).

Customer Support

Find Kontron contacts by visiting: <https://www.kontron.com/support-and-services>.

Customer Service

As a trusted technology innovator and global solutions provider, Kontron extends its embedded market strengths into a services portfolio allowing companies to break the barriers of traditional product lifecycles. Proven product expertise coupled with collaborative and highly-experienced support enables Kontron to provide exceptional peace of mind to build and maintain successful products.

For more details on Kontron's service offerings such as: enhanced repair services, extended warranty, Kontron training academy, and more visit <https://www.kontron.com/support-and-services>.

Customer Comments

If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact [Kontron support](#). Detail any errors you find. We will correct the errors or problems as soon as possible and post the revised user guide on our website.

Symbols

The following symbols may be used in this user guide

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

NOTICE indicates a property damage message.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.



ESD Sensitive Device!

This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.



HOT Surface!

Do NOT touch! Allow to cool before servicing.



Laser!

This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.



This symbol indicates general information about the product and the user guide.

This symbol also indicates detail information about the specific product configuration.



This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠ CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠ CAUTION



Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

CAUTION

Danger of explosion if the battery is replaced incorrectly.

- ▶ Replace only with same or equivalent battery type recommended by the manufacturer.
 - ▶ Dispose of used batteries according to the manufacturer's instructions.
-

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit <http://www.kontron.com/about-kontron/corporate-responsibility/quality-management>.

Disposal and Recycling

Kontron's products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- ▶ Reduce waste arising from electrical and electronic equipment (EEE)
- ▶ Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- ▶ Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- ▶ Improve the environmental performance of all those involved during the lifecycle of EEE



Environmental protection is a high priority with Kontron.

Kontron follows the WEEE directive

You are encouraged to return our products for proper disposal.

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1/ Introduction

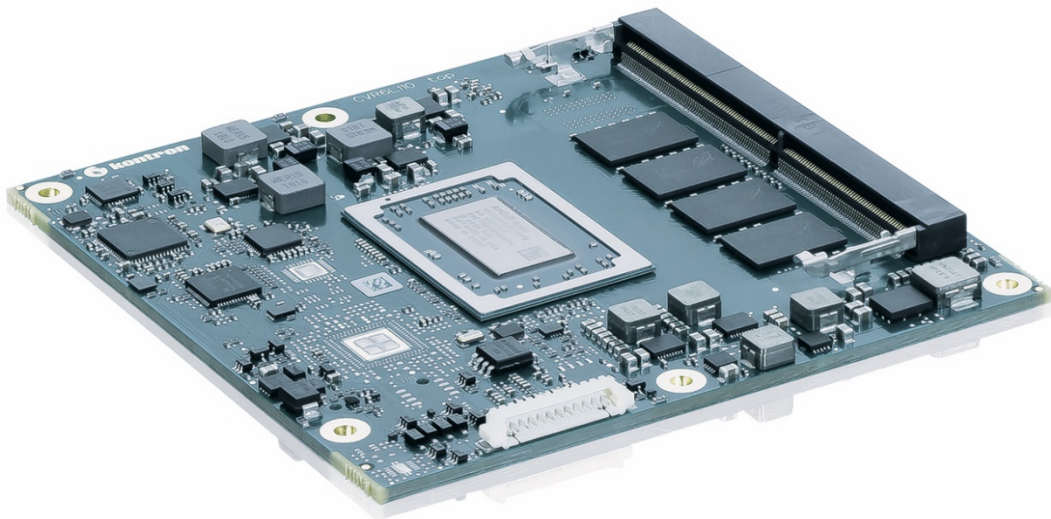
1.1. Product Description

The COMe-cVR6 (E2) deliver high-performance, feature-rich Computer-on-Modules based on the standardized COM Express® compact form factor and AMD's Ryzen Embedded V- and R-Series processors. Through the use of COM Express connectors the COMe-cVR6 is easily exchangeable and offers the most flexibility for customers designing it into their embedded devices based on individual carrier boards.

Basic COMe-cVR6 features are:

- ▶ AMD's Ryzen Embedded V- and R-Series with integrated chipset
- ▶ 1x DDR4 SO-DIMM up to 32 Gbyte, 2nd channel DDR4 memory down up to 16 Gbyte
- ▶ Integrated AMD Vega Graphics (GFX9)
- ▶ 2x SATA 6 Gb/s

Figure 1: COMe-cVR6



1.2. Product Naming Clarification

COM Express® defines a Computer-On-Module, or COM, with all the components necessary for a bootable host computer, packaged as a super component. The product names for Kontron COM Express® Computer-on-Modules consist of:

- ▶ Short form of the industry standard
 - ▶ COMe-
- ▶ Module form factor
 - ▶ b=basic (125 mm x 95 mm)
 - ▶ c=compact (95mm x 95 mm)
 - ▶ m=mini (84 mm x 55 mm)
- ▶ Processor code name
 - ▶ VR = AMD's Ryzen Embedded V- and R-Series
- ▶ Pinout type
 - ▶ Type 6
- ▶ Available temperature variants
 - ▶ Commercial
 - ▶ Extended (E1)
 - ▶ Industrial (E2)
 - ▶ Screened industrial (E2S) and Rapid shutdown screened industrial (R E2S)
- ▶ Processor Identifier
- ▶ Chipset identifier (if chipset assembled)
- ▶ Memory size
 - ▶ Memory Down + DIMM memory (#GB) / eMMC SLC memory (#S)

1.3. COM Express® Documentation

The COM Express® specification defines the COM Express® module form factor, pinout and signals. The COM Express document is available at the PICMG® website.

1.4. COM Express® Functionality

All Kontron COM Express® basic and compact modules contain two 220-pin connector. Each connector has two rows called Row A & B on primary connector and Row C & D on secondary connector. COM Express® Computer-On-Modules feature the following maximum amount of interfaces according to the PICMG module pinout type:

Table 1: Pin Assignment of Type 6 and COMe-cVR6

Feature	Type 6 Pinout	COMe-cVR6 Pinout
HD Audio	1x	1x
Gbit Ethernet	1x	1x
Serial ATA	4x	2x
PCI Express x 1	8x	up to 5x PCIe 3.0 (On request: 6x without Ethernet) On request: up to 8x PCIe x1 with 4x PCIe 3.0 + 4x PCIe 2.0
PCI Express x16 (PEG)	1x	up to 1x x8
USB Client	1x	
USB	4x USB 3.0 (Incl. USB 2.0) + 4x USB 2.0	up to 3x USB 3.x (incl. USB 2.0) + 5x USB 2.0
VGA	1x	1x optional
LVDS (eDP)	Dual Channel	Dual Channel LVDS with option to overlay with embedded Display port (eDP)
DP++ (DP/HDMI/DVI)	3x	up to 3x
LPC	1x	1x
External System Management Bus (SMB)	1x	1x
External I2C	1x	1x
GPIO	8x	8x GPIO
SDIO shared w/GPIO	1x optional	
UART (2-wire COM)	2x	2x
FAN PWM out	1x	1x
Express Card	2x	

1.5. COM Express® Benefits

COM Express® defines a Computer-On-Module, or COM, with all the components necessary for a bootable host computer, packaged as a highly integrated computer. All Kontron COM Express® modules are very compact and feature a standardized form factor and a standardized connector layout that carry a specified set of signals. Each COM is based on the COM Express® specification. This standardization allows designers to create a single-system baseboard that can accept present and future COM Express® modules.

The baseboard designer can optimize exactly how each of these functions implements physically. Designers can place connectors precisely where needed for the application, on a baseboard optimally designed to fit a system's packaging.

A single baseboard design can use a range of COM Express® modules with different sizes and pinouts. This flexibility differentiates products at various price and performance points and provides a built-in upgrade path when designing future-proof systems. The modularity of a COM Express® solution also ensures against obsolescence when computer technology evolves. A properly designed COM Express® baseboard can work with several successive generations of COM Express® modules.

2/ Product Specification

2.1. Module Variants

The COMe-cVR6 is available in different processor and temperature variants to cover demands in performance, price and power.

2.1.1. Commercial Grade Modules (0°C to +60°C)

Table 2: Product Number for Commercial Grade Modules (0°C to +60°C operating)

Product Number	Product Name	Description
36026-8000-34-4	COMe-cVR6 V1807B 8G	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1807B, 4x3.35 GHz, 8GB memory down, DDR4 SO DIMM Socket
36026-0000-34-4	COMe-cVR6 V1807B	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1807B, 4x3.35 GHz, DDR4 SO DIMM Socket
36026-0000-33-4	COMe-cVR6 V1756B	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1756B, 4x3.25 GHz, DDR4 SO DIMM Socket
36026-4000-20-4	COMe-cVR6 V1605B 4G	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1605B, 4x2.0 GHz, 4GB memory down, DDR4 SO DIMM Socket
36026-0000-20-4	COMe-cVR6 V1605B	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1605B, 4x2.0 GHz, DDR4 SO DIMM Socket
36026-0000-23-2	COMe-cVR6 V1202B	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1202B, 2x2.3 GHz, DDR4 SO DIMM Socket
36026-0000-26-2	COMe-cVR6 R1606G	COM Express® compact pin-out type 6 Computer-on-Module with AMD R1606G, 2x2.6 GHz, PCIe Switch, DDR4 SO DIMM Socket
36026-0000-24-2	COMe-cVR6 R1505G	COM Express® compact pin-out type 6 Computer-on-Module with AMD R1505G, 2x2.4 GHz, PCIe Switch, DDR4 SO DIMM Socket

2.1.2. Extended Temperature Grade Modules (E1, -25°C to 75°C)

Extended Temperature grade modules (E1, -25°C to 75°C) are available as a standard product number, on request. For further information, contact your local Kontron sales representative or Kontron Inside Sales.

2.1.3. Industrial Temperature Grade Modules (E2/E2S, -40°C to 85°C)

Industrial temperature grade modules (E2/E2S, -40°C to 85°C) are available project based only (screening) or alternatively COMe-cVR6 E2. For further information, contact your local Kontron sales representative or Kontron Inside Sales.

Table 3: Product Number for Industrial Grade Modules (-40°C to +85°C operating)

Product Number	Product Name	Description
36027-4000-20-4	COMe-cVR6 E2 V1404I 4E	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1404I, 4x 2.0 GHz, 4GB ECC memory down, industrial temperature grade
36027-0000-20-4	COMe-cVR6 E2 V1404I	COM Express® compact pin-out type 6 Computer-on-Module with AMD V1404I, 4x 2.0 GHz, DDR4 SO DIMM Socket, industrial temperature grade

2.2. Accessories

Accessories are either COMe-cVR6 product specific, type 6 COMe pinout specific, or general accessories including memory modules. For more information, contact your local Kontron sales representative or Kontron Inside Sales.

Table 4: Product Accessories-COMe-cVR6

Part Number	Heatspreader (validated ref.types)	Description
36026-0000-99-0	HSP COMe-cVR6 Cu-core threaded	Heatspreader for COMe-cVR6, Cu-core, threaded mounting holes, high performance
36026-0000-99-1	HSP COMe-cVR6 Cu-core threaded	Heatspreader for COMe-cVR6, Cu-core, threaded mounting holes, high performance
36026-0000-99-2	HSP COMe-cVR6 threaded	Heatspreader for COMe-cVR6, threaded mounting holes, high performance
36026-0000-99-3	HSP COMe-cVR6 threaded	Heatspreader for COMe-cVR6, threaded mounting holes, low performance

Table 5: COMe Type 6 Accessories

Part Number	COMe Carrier	Project Code	Description
38115-0000-00-x	COM Express® Reference Carrier-i Type 6	ADTI	Thin-mITX Carrier with 5 mm COMe connector
38116-0000-00-5	COM Express® Eval Carrier2 Type 6	ADT6	ATX Carrier with 5 mm COMe connector
Part Number	COMe Adapter / Card	Project Code	Description
96007-0000-00-3	ADA-PCIe-DP	APDP	PCIe x16 to DP Adapter for Evaluation Carrier
96007-0000-00-7	ADA-Type6-DP3	DV06	(Sandwich) Adapter Card for 3x Displayport
96006-0000-00-2	COMe POST T6	NFCB	POST Code / Debug Card
38019-0000-00-0	ADA-COMe-Height-dual	EERC	Height Adapter

Table 6: General Accessories

Part Number	Cooling Solutions	Description
36099-0000-99-4	COMe Active Uni Cooler2 (w/o HSP)	COM Express® Universal Active Cooler for Heatspreader Mounting (95x95x14.3) - 90° turnable
36099-0000-99-5	COMe Passive Uni Cooler2 (w/o HSP)	COM Express® Universal Passive Cooler for Heatspreader Mounting (95x95x14.3) - 90° turnable
Part Number	Mounting	Description
38017-0000-00-5	COMe Mount KIT 5 mm 1 set	Mounting Kit for 1 module including screws for 5 mm connectors
38017-0100-00-5	COMe Mount KIT 5 mm 100 sets	Mounting Kit for 100 modules including screws for 5 mm connectors
38017-0000-00-0	COMe Mount KIT 8 mm 1 set	Mounting Kit for 1 module including screws for 8 mm connectors
38017-0100-00-0	COMe Mount KIT 8 mm 100 sets	Mounting Kit for 100 modules including screws for 8 mm connectors
Part Number	Display Adapters	Description
96006-0000-00-8	ADA-DP-LVDS	DP to LVDS adapter
96082-0000-00-0	KAB-ADAPT-DP-DVI	DP to DVI adapter cable
96083-0000-00-0	KAB-ADAPT-DP-VGA	DP to VGA adapter cable
96084-0000-00-0	KAB-ADAPT-DP-HDMI	DP to HDMI adapter cable
Part Number	Cables	Description
96079-0000-00-0	KAB-HSP 200 mm	Cable adapter to connect fan to module (COMe basic/compact)
96079-0000-00-2	KAB-HSP 40 mm	Cable adapter to connect fan to module (COMe basic/compact)

Table 7: Memory Modules

Part Number	Memory Non ECC (validated reference types)	
97020-3224-CVR6	DDR4-2400 SODIMM 32GB_CVR6	DDR4-2400, 32GB, 260P, 1200MHz, PC4-2400 SODIMM
97020-1624-CVR6	DDR4-2400 SODIMM 16GB_CVR6	DDR4-2400, 16GB, 260P, 1200MHz, PC4-2400 SODIMM
97020-0824-CVR6	DDR4-2400 SODIMM 8GB_CVR6	DDR4-2400, 8GB, 260P, 1200MHz, PC4-2400 SODIMM
97020-0424-CVR6	DDR4-2400 SODIMM 4GB_CVR6	DDR4-2400, 4GB, 260P, 1200MHz, PC4-2400 SODIMM
97021-3224-CVR6	DDR4-2400 SODIMM 32GB E2_CVR6	DDR4-2400, 32GB, E2, 260P, 1200MHz, PC4-2400 SODIMM
97021-1624-CVR6	DDR4-2400 SODIMM 16GB E2_CVR6	DDR4-2400, 16GB, E2, 260P, 1200MHz, PC4-2400 SODIMM
97021-0824-CVR6	DDR4-2400 SODIMM 8GB E2_CVR6	DDR4-2400, 8GB, E2, 260P, 1200MHz, PC4-2400 SODIMM
97021-0424-CVR6	DDR4-2400 SODIMM 4GB E2_CVR6	DDR4-2400, 4GB, E2, 260P, 1200MHz, PC4-2400 SODIMM
Part Number	Memory ECC (validated reference types)	
97030-3224-CVR6	DDR4-2400 SODIMM 32GB ECC_CVR6	DDR4-2400, 32GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM
97030-1624-CVR6	DDR4-2400 SODIMM 16GB ECC_CVR6	DDR4-2400, 16GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM
97030-0824-CVR6	DDR4-2400 SODIMM 8GB ECC_CVR6	DDR4-2400, 8GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM
97030-0424-CVR6	DDR4-2400 SODIMM 4GB ECC_CVR6	DDR4-2400, 4GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM
97031-3224-CVR6	DDR4-2400 SODIMM 32GB ECC E2_CVR6	DDR4-2400, 32GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM
97031-1624-CVR6	DDR4-2400 SODIMM 16GB ECC E2_CVR6	DDR4-2400, 16GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM
97031-0824-CVR6	DDR4-2400 SODIMM 8GB ECC E2_CVR6	DDR4-2400, 8GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM
97031-0424-CVR6	DDR4-2400 SODIMM 4GB ECC E2_CVR6	DDR4-2400, 4GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM

NOTICE

In general, memory modules have a much lower longevity than embedded motherboards, and therefore the EOL of the memory modules may occur several times during the lifetime of the module. Kontron guarantees to maintain memory modules by replacing EOL memory module with another qualified similar module.

2.3. Functional Specification

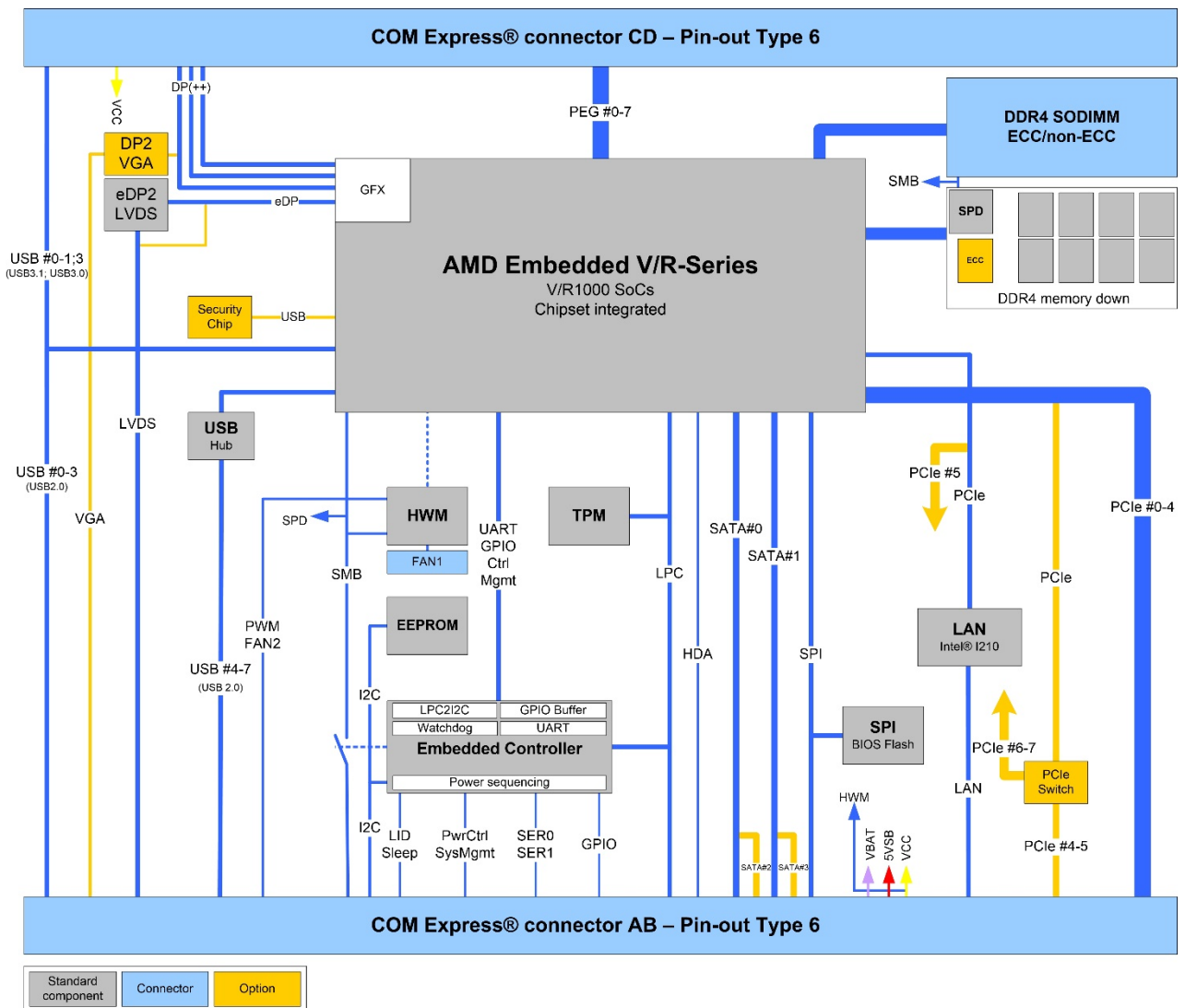
2.3.1. Technical Data

Table 8: Technical Data

Function	Definition
Compliance	COM Express® compact, Pin-out Type 6
Dimensions (H X W)	95mm x 95 mm
CPUs	AMD Ryzen Processor V1000: V1807B, V1756B, V1605B, V1202B, V1404I, R1000: R1606G, R1505G
Main Memory	<ul style="list-style-type: none"> ▶ Channel 1: 1x SO-DIMMs DDR4; up to 3200 MHz non-ECC/ECC ▶ Channel 2: Memory down 8x (9x for ECC) DDR4 x8 Chips; up to 3200 MHz non-ECC/ECC
Graphics Controller	Vega GPU
Graphic Interfaces	up to 3x DP, LVDS, VGA and eDP optional
Ethernet	1x 10/100/1000 Mbit
Hard Disk	2x SATA 6 Gb/s
PCI Express® Support	Up to 5x PCIe 3.0 (On request: 6x without Ethernet) On request: Up to 8x PCIe x1 with 4x PCIe 3.0 + 4x PCIe 2.0
USB	up to 3x USB 3.x (incl. USB 2.0) + 5x USB 2.0
Serial	2x UART
Audio	High Definition Audio
Common Features	SPI, LPC, SMB, Fast I ² C, Staged Watchdog, RTC
BIOS	AMI Aptio V
Power Supply	8.5 V to 20 V Wide Range, Single Supply Power
Approtect	Optional Wibu Code Meter ASIC connected to SoC USB Port 0 Wibu chip is only stuffed for option Security_WIBU
Operating Systems	Windows® 10, Linux
Temperature	Commercial Grade Temperature: -0 °C to +60 °C operating, -30 °C to +85 °C non-operating Industrial Temperature: -40 °C To +85 °C operating, -40 °C to +85 °C non-operating
Embedded / Module System Management Controller (FPGA)	Altera MAX10 10M02SCU16917 (FPGA MAX 10 UBGA169 Industrial range) or pin compatible part can be assembled. EC implements Kontron COMe CPLD Specification 2.6 VHDL block (KCPLD). EC implements Power Sequencing and reset control for all components.
SPI BIOS Memory	Dual 8 MB SPI Flashes.
Embedded EEPROM (EeeP)	Former JIDA EEPROM
USB Hub	The SMSC USB2514BI 4-Port Hub Controller is connected to USB port 5 of the V1000. It provides four downstream ports supporting Full Speed and High Speed mode at the COM Express connector.
Hardware Monitor (HWM)	Chip Nuvoton NCT7802Y, SM-Bus Adress: 5C.

2.3.2. Block Diagram COMe-cVR6

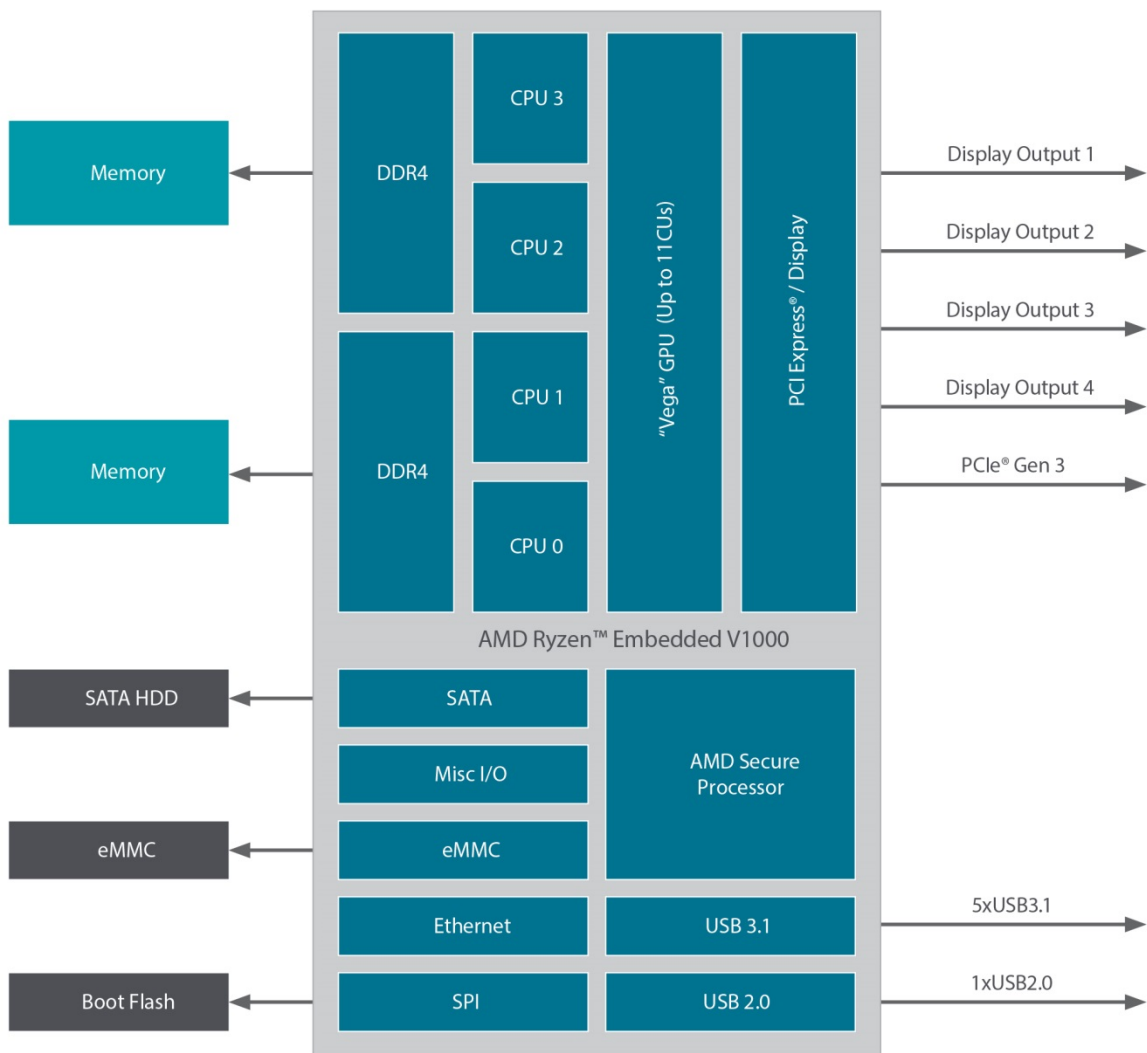
Figure 2: Block Diagram COMe-cVR6



2.3.3. V1000 Processors

AMD Ryzen™ Embedded V1000 SOCs deliver up to a 52 % Instructions per Cycle (IPC) boost at the CPU and up to a 107 % improvement in Graphics performance. Utilizing a 14 nm FinFET process, the AMD Ryzen™ Embedded V1000 combines higher performance at comparable Thermal Design Power (TDPs). Up to four CPU cores/eight threads and 11 GPU compute units can be harnessed to achieve high processing throughput.

Figure 3: Block Diagram Ryzen V1000 processor (Source: AMD)



Key Benefits are:

- ▶ AMD Ryzen™ Embedded V1000 SOCs can power up to four independent displays in 4K resolution via DisplayPort/eDP and/or HDMI, and support for High Dynamic Range (HDR) displays.
- ▶ Equipped with dual-channel 64-bit DDR4 with performance up to 3200 MT/s, AMD Ryzen™ Embedded V1000 SOCs provide up to 16 PCIe lanes, dual Ethernet, up to four USB 3.1 Gen 2 interconnects, with additional USB, SATA and NVMe support.
- ▶ Planned product availability extends up to 10 years, providing customers with a long-lifecycle support roadmap.
- ▶ Package: FP5, Package Size 25mmx35mm; Max Z-height 1.38mm

Table 9: V1000 Processor Specifications

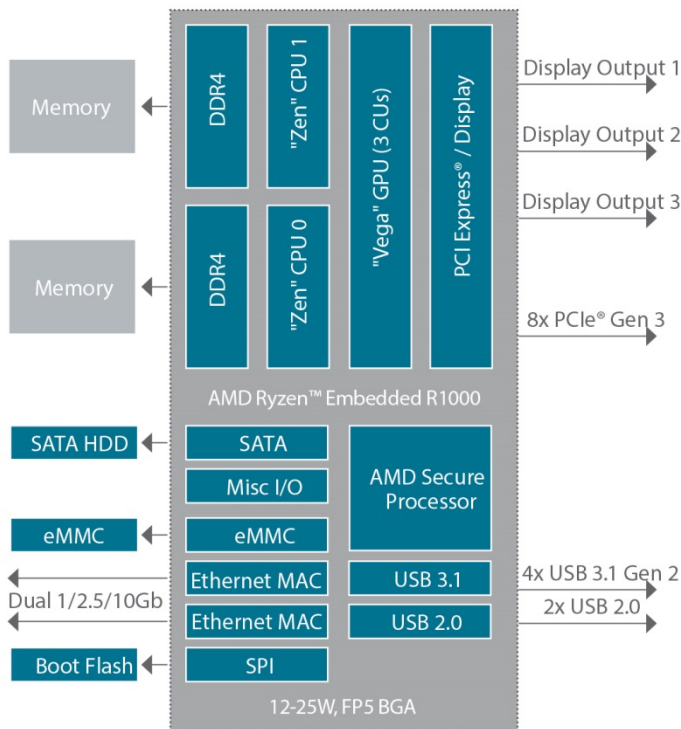
Processor	V1807B	V1756B	V1605B	V1202B	V1404I
# of Cores	4	4	4	2	4
# of Threads	8	8	8	4	8
Processor Base Frequency	3.35	3.25	2.0	2.3	1.6/2.0
1T Boost Frequency	3.8	3.6	3.6	3.6	2.8/3.6 ¹
Operating Temperature	0-90 °C	0-90 °C	0-90 °C	0-90 °C	-40-105 °C
Thermal Design Power (TDP)	35-54 W	35-54 W	12-25 W	12-25 W	12 to 25 W
L2 Cache	2 MB	2 MB	2 MB	1 MB	2 MB
Memory Types ²	64-bit DDR4, ECC, 3.2 GHz	64-bit DDR4, ECC, 3.2 GHz	64-bit DDR4, ECC, 2.4 GHz	64-bit DDR4, ECC, 2.4 GHz	64-bit DDR4, ECC, 2.4 GHz
Max. Memory Size	32 GB	32 GB	32 GB	32 GB	32 GB
Independent Displays	4	4	4	4	4
Package	FP5	FP5	FP5	FP5	FP5
Ethernet	10/100/1000 Mbit	10/100/1000 Mbit	10/100/1000 Mbit	10/100/1000 Mbit	10/100/1000 Mbit

¹Targeted performance in the -40 to 0°C temp range

2.3.4. R1000 Processors

AMD Ryzen™ Embedded R1000 can power up to three independent displays in 4K resolution via DisplayPort™ 1.4b and/or HDMI™ 2.0b. The integrated Video Hardware Accelerator supports decode or encode for various widely used video codecs with resolutions up to 4K. AMD Ryzen™ Embedded R1000 SoCs provide up to 8 PCIe® lanes and up to three USB 3.1 Gen 2 interconnects.

Figure 4: Block Diagram Ryzen R1000 processor (Source: AMD)



Key Benefits are:

- ▶ AMD Ryzen™ Embedded R1000 SOCs can power up to three independent displays in 4K resolution via DisplayPort/eDP and/or HDMI.
- ▶ Equipped with single or dual-channel 64-bit DDR4 with performance up to 2400 MT/s, AMD Ryzen™ Embedded R1000 SOCs provide up to 8 PCIe lanes.
- ▶ Planned product availability extends up to 10 years, providing customers with a long-lifecycle support roadmap.
- ▶ Package: FP5, Package Size 25 mm x 35 mm; Max Z-height 1.38 mm

Table 10: R1000 Processor Specifications

Processor	R1606G	R1505G
TDP Range	12-25 W ¹	12-25 W ¹
# of Cores/Threads	2/4	2/4
Processor Base Frequency (GHz)	2.6	2.4
1T Boost Frequency (GHz)	3.5	3.3
Graphics Computing Units	3	3
GPU Frequency max. (GHz)	1.2	1.0
Individual Displays	3	3
Package	FP5	FP5
Max DDR4 Rate (MT/s)	2,400	2,400
Dual Ethernet Ports	10/100/1000 Mbit	10/100/1000 Mbit
Junction Temperature Range (°C)	0 – 105°C	0 – 105°C
PCI Lanes	8 Lanes Gen3 (4x GPP + 4x GfX)	8 Lanes Gen3 (4x GPP + 4x GfX)
Max Channel	dual Channel	dual Channel

¹ Nominal TDP = 15 W, configurable in BIOS

2.3.5. System Memory

The system memory supports single and dual-channel DDR4 up to 3200 MT/s with ECC/nonECC. Following setups are considerable:

- ▶ Channel 1: 1x SO-DIMMs DDR4; up to 32 GB DDR4 non-ECC/ECC (max frequency depending on used SoC).
- ▶ Channel 2: Memory down 8x (9x for ECC) DDR4 chips; up to 16 GB non-ECC/ECC (max frequency depending on used SoC)

Table 11: System Memory

Socket	Dual-channel DDR4
Memory Type	DDR4-3200/DDR4-2400
Memory Module Size	4 Gbyte, 8 Gbyte, 16 Gbyte, 32 Gbyte
Bandwidth (max)	DDR4 up to 3200 MT/s

As a minimum, it is recommend to use Kontron memory modules for prototype system(s) in order to prove the stability of the system and as a reference. In order to qualify RAM it is recommend to configure three systems running a RAM Stress Test program in a heat chamber at 60°C, for a minimum of 24 hours.



For a list of Kontron memory modules, see 2.2.

NOTICE

The V1807B and V1756B SoCs support up to 3200 MHz. The AMD SoC reduces the bandwidth automatically from 3200 MHz to 2400 MHz when dual ranks are used.

Table 12: Memory Bandwidth

APU	Memory Rank	Max Data Rate (MT/s)
V1807B	Single Rank	DDR4-3200
	Dual Rank	DDR4-2400
V1756B	Single Rank	DDR4-3200
	Dual Rank	DDR4-2400
V1605B	Single Rank	DDR4-2400
	Dual Rank	DDR4-2400
V1202B	Single Rank	DDR4-2400
	Dual Rank	DDR4-2400
V1404I	Single Rank	DDR4-2400
	Dual Rank	DDR4-2400
R1606G	Single Rank	DDR4-2400
	Dual Rank	DDR4-2400
R1505G	Single Rank	DDR4-2400
	Dual Rank	DDR4-2400

2.3.6. Graphics

2.3.6.1. Display Resolution

The following table lists the maximum display resolutions at a set frequency and bit per pixel (bpp) for the supported display interfaces.

Table 13: Display Resolution

Display Interfaces	Maximum Resolution (Pixel)
eDP 1.3	4096 x 2160
DP 1.4	3840 x 2160 @ 120 Hz Max (HBR3) Re-timer or Re-driver is required for HBR3 support HDR meta-data
HDMI 2.0	Version 2.0b 4096 x 2160@60 Hz Max (6 Gb/s) RGB YUV444, YUV 422 and YUV420 Re-timer required for operation above 3 Gb/s

2.3.6.2. Digital Display Interface (DDI)

The graphic part supports "Vega" GPU with up to 11 Compute Units and H.2652 Decode & (8-bit) Encode. Up to four independent Digital Display Interfaces (DDIs) can be used simultaneously and in combination, to implement an independent or cloned display configuration. UHD Blu-Ray is not supported.

The standard DDIs are:

- ▶ up to 3x DP 1.4
- ▶ 1x eDP 1.3
- ▶ up to 3x HDMI 2.0b

Table 14: Display Interfaces

SoC Port	COMe Port	
DP0	DDI1 (DP++) w. Audio	
DP1	DDI2 (DP++) w. Audio	VGA (option)
DP2	DDI3 ¹ (DP++) w. Audio	
DP3	LVDS	eDP (option)

¹ DDI3 is not supported with R1505R/R1606G SKUs

Table 15: DDI1 Interfaces

COMe Connector	SoC	Description
DDI1_PAIR[0:3]	DP0_TX[0:3]	
DDI1_PAIR[4:6]	-	
DDI1_CTRLCLK_AUX+	DP0_AUXP	
DDI1_CTRLDATA_AUX-	DP0_AUXN	
DDI1_DDC_AUX_SEL	-	Connected to DP++ AUX Conversion
DDI1_HPD	DP0_HPD	

Table 16: DDI2 Interfaces

COMe Connector	SoC	Description
DDI2_PAIR[0:3]	DP1_TX[0:3]	Optional to VGA Bridge
DDI2_PAIR[4:6]	-	
DDI2_CTRLCLK_AUX+	DP1_AUXP	
DDI2_CTRLDATA_AUX-	DP1_AUXN	
DDI2_DDC_AUX_SEL	-	Connected to DP++ AUX Conversion
DDI2_HPD	DP1_HPD	

Table 17: DDI3 Interfaces

COMe Connector	SoC	Description
DDI3_PAIR[0:3]	DP2_TX[0:3]	
DDI3_PAIR[4:6]	-	
DDI3_CTRLCLK_AUX+	DP2_AUXP	
DDI3_CTRLDATA_AUX-	DP2_AUXN	
DDI3_DDC_AUX_SEL	-	Connected to DP++ AUX Conversion
DDI3_HPD	DP2_HPD	

2.3.6.3. LVDS

LVDS is implemented by NXP PTN3460 eDP to LVDS bridge chip:

- ▶ Input: Two eDP Lanes from CPU.
- ▶ Output: Dual Channel LVDS to COMe connector.

Table 18: LVDS Bridge

COMe Connector	PTN3460	Description
LVDS_A*	LVS*O	Pin order according to COMe spec
LVDS_B*	LVS*E	
LVDS_I2C_CK	-	connected to I2C_INT module bus
LVDS_I2C_DAT	-	connected to I2C_INT module bus
LVDS_VDD_EN	PVCCEN	
LVDS_BKLT_EN	BKLTEN	
LVDS_BKLT_CTRL	-	connected to EDP_BKLTCTL at SoC

2.3.6.4. eDP

eDP is only available as option which bypasses the eDP2LVDS bridge.

Table 19: eDP

COMe Connector	SoC	Description
LVDS_A_CK	DP3_TX3	
LVDS_A2	DP3_TX0	
LVDS_A1	DP3_TX1	
LVDS_A0	DP3_TX2	
LVDS_I2C_CK	DP3_AUXN	
LVDS_I2C_DAT	DP3_AUXP	
EDP_HPD	DP3_HPD_SOC	
LVDS_VDD_EN	EDP_VDD_EN_1V8	passed through FPGA/EC
LVDS_BKLT_EN	EDP_VDD_EN_1V8	passed through FPGA/EC
LVDS_BKLT_CTRL	EDP_BKLT_CTRL_1V8	passed through FPGA/EC

2.3.6.5. VGA

VGA is implemented by Chrontel CH7517 DisplayPort to VGA bridge chip:

- ▶ Input: two DisplayPort Lanes from CPU DDI3.
- ▶ Output: VGA Video + VGA DDC

2.3.7. Audio

The HD Audio (HDA) stream can be supported simultaneously on HDMI/DP.

Table 20: Audio

COMe Connector	SoC	Description
HDA_RST#	HDA_RST_1V8#	Passed through Levelshifter TXB0108
HDA_SYNC	HDA_WS_SYNC	Passed through Levelshifter TXB0108
HDA_BITCLK	HDA_BCLK_1V8	Passed through Levelshifter TXB0108
HDA_SDOOUT	HDA_SDO_1V8	Passed through Levelshifter TXB0108
HDA_SDIN[0:2]	HDA_SDI[0:2]_1V8	Passed through Levelshifter TXB0108

2.3.8. LPC

Table 21: LPC

COMe Connector	SoC	Description
LPC_AD[0:3]	LAD[0:1]/SD_DATA[0:1]/EGPIO	
LPC_FRAME#	LFRAME_L/EGPIO109	
LPC_DRQ0#	ESPI_ALERT_L/LDRQ0_L/EGPIO108	
LPC_DRQ1#	Not available	
LPC_SERIRQ	SERIRQ/AGPIO	
LPC_CLK	LPC_CLKRUN#/AGPIO88	Optional Clock Buffer
LPC_RST	SD_WP#/AGPIO32	To FPGA
LPC_PME	SD_PWR_CTRL/AGPIO22	Not used

2.3.9. I2C Bus

Two I2C Buses are generated by FPGA's internal kCPLD block:

- ▶ 1. External user-accessible I2C connected to embedded EEPROM and COM Express connector.
 - ▶ a. Optional: SoC-USBC-I2C connected to external I2C Bus
- ▶ 2. Internal on-module I2C connected to VGA-bridge, LVDS-bridge, external LVDS-DDC-interface.

2.3.10. SMBus

SMBus clock and data lines are divided into multiple voltage domains by discrete FET level shifters.

Table 22: SMBus

SoC (3.3V, S0)	HWM (3.3V, S0)	COMe (3.3V, S5 EN_SMB_EXT)	PCIE_Switch (3V3, S0)
SMB_CLK_S0	SMB_CLK_S0	SMB_CLK_EXT	PCIE_SW_SMB_CLK
SMB_DATA_S0	SMB_DATA_S0	SMB_DATA_EXT	PCIE_SW_SMB_CLK

RAM (2.5V, S3)	LAN (3.3V, S5)
SMB_CLK_RAM	SMB_CLK_LAN
SMB_DATA_RAM	SMB_DATA_LAN

SMB Alert# connects directly to COMe, for NVMe a level shifter is used.

Table 23: SMB Alert#

SoC	COMe (3.3V)
Blink/AGPIO11	SMB_ALERT#
SoC	COMe (3.3V)

2.3.11. Wake Signals

Table 24: Wake Signals

COMe Signal	SoC Pin	Description
WAKE0#	WAKE#/AGPIO2	passed through FPGA/EC
WAKE1#	AGPIO/SATEE_IFDET	passed through FPGA/EC

2.3.12. Suspend Control

Table 25: Suspend Control

COMe Signal	SoC Pin	Description
SUS_STAT#/ESPI_RESET#	From FPGA	LPC_PD# signal might be used for SUS_STAT#
SUS_S3#	SOC_SLP_S3#	passed through FPGA
SUS_S4#	From FPGA	
SUS_S5#	SOC_SLP_S5#	passed through FPGA

2.3.13. Carrier Board Reset (CB_RESET#)

Table 26: Carrier Board Reset (CB_RESET#)

COMe Signal	SoC Pin	Description
CB_RESET#	SOC_PMU_RST_1V8#	Output to carrier. Implemented in FPGA/EC

2.3.14. System Reset (SYS_RESET#)

Table 27: System Reset (SYS_RESET#)

COMe Signal	SoC Pin	Description
SYS_RESET#	SOC_SYS_RESET#	Input from carrier. Passed through FPGA/EC

2.3.15. External BIOS ROM Support/SPI

The Boot SPI0 is routed to COMe connector. BOM option allows general purpose SPI (GSPI0) to be connected to COMe instead.

Table 28: External BIOS ROM Support

COMe Signal	SoC Pin	Description
SPI_CS#	SPI0_CS0# / SPI0_CS1#	SPI_CS# logic implemented in EC
SPI_MISO	SPI_MISO_1V8	Passed through Levelshifter SN74AVC4T774
SPI_MOSI	SPI_MOSI_1V8	Passed through Levelshifter SN74AVC4T774
SPI_CLK	SPI_CLK_1V8	Passed through Levelshifter SN74AVC4T774
SPI_POWER	-	connected to V_3V3_S5
BIOS_DIS0#		input to control SPI_CS# logic
BIOS_DIS1#		input to control SPI_CS# logic

COMe-cVR6 supports on-module and off-module boot from SPI. For additional safety, a second on-module SPI flash can be populated on the board. This also requires an adoption of the FPGA/EC code.

Table 29: External BIOS ROM Support: On-module and Off-module boot from SPI

BIOS_DIS1#	BIOS_DIS0#	MODULE_CS#	COMe_CS#	BIOS entry	Description
1	1	SPI0_CS0#	'1'	Module	
1	0	SPI0_CS0#	'1'	(Module)	Not Supported, was FWH, works as module SPI
0	1	SPI0_CS1#	SPI0_CS0#	Carrier	
0	0	SPI0_CS0#	SPI0_CS1#	Module	

2.3.16. Speaker Out (SPKR)

Table 30: Speaker Out (SPKR)

COMe Signal	SoC Pin	Description
SPKR	SPKR/AGPIO90	Speaker/Buzzer out

2.3.17. Watchdog Timeout (WDT)

Table 31: Watchdog Timeout (WDT)

COMe Signal	SoC Pin	Description
WDT	po_wdt_o	Generated from kCPLD VHDL block

2.3.18. Hardware Monitor (HWM)

Chip Nuvoton NCT7802Y, SM-Bus Adress: 5C.

Table 32: HWM

HWM Pin	Function	Description
VCORE	V_BAT	Measured with impedance converter, and G3 Isolation to prevent leakage in OPAMP
VSEN1	SoC Temp	Via external NTC resistor placed close to SoC
VREF	VREF output	Used for External NTC resistor (VSEN1)
VSEN2	COMe VCC (V_IN_VAR)	Voltage divider defined in schematics
VSEN3	COMe 5VSB (V_IN_5V0_S5)	Voltage divider defined in schematics
FANIN1	TACH_IN	From onboard FAN connector
FANCTL1	V_FAN	Controls output voltage of onboard FAN connector via CPLD
FANIN2	FAN_TACHIN	From COMe-connector
FANCTL2	FAN_PWMOUT	To COMe-connector via CPLD
FANCTL3/SDD2	-unused-	Strap to set SMB address
PECI	-unused-	NC
RESET#	-unused-	(Reset alarm output, for detect VCC power fault)
SDA	SMBDATA	
SCL	SMBCLK	
ALERT#/SMI#	NC	Optional connection to SMB_ALERT
T_CRIT#/BEEP	NC	Optional connection to THRM#

2.3.19. Trusted Platform Module (TPM)

Chip is Infineon SLB9665 (TPM 2.0), connected to LPC.

Table 33: TPM

TPM Pin	PCH Pin	Description
LAD[0:3]	LPC_AD[0:3]	
LCLK	CLK_33M_LPC_TPM	
LFRAME#	LPC_FRAME#	
LRESET		Generated in FPGA from PLTRST#
GPIO	-	Not connected
TPM_PP	-	To COMe TPM_PP Pin

2.3.20. Onboard Fan Connector

The analog output voltage on this connector is generated via a discrete linear voltage regulator from the PWM signal of the HWM. It is clipped at 12 V (+/- 10 %) across the whole input range of the module to prevent Fan damage at higher voltages.

The maximum supply current to the fan connected to the on-module fan connector is 350 mA if the input voltage is below 13.0 V and is further limited to 150 mA if the input voltage to the module is between 13.0 V and 20.0 V.

Table 34: Onboard Fan Connector

Connector Pin	Description
1	FAN_TACH_IN#
2	V_FAN
3	GND

Table 35: Fan Control

COMe Signal	HWM Pin
FAN_PWMOUT	FANCTL2
FAN_TACHIN	FANIN2

2.3.21. General Purpose PCI Express 3.0 (V1000 SKUs)

The V1000 processors support a total of x8 GPP lanes (up to Gen 3):

- ▶ Lane [4:0] is used as COMe PCIe; Lane 4 optionally connected to PCIe Switch
- ▶ Lane 5 connected to i210, optionally connected to COMe PCIe 5
- ▶ Lane [7:6] are multiplexed with SATA

Table 36: General Purpose PCI Express 3.0 for V1000 SKUs

COMe connector	GPP Lane	Lane Config		
PCIE0	0	x1	x2	x4
PCIE1	1	x1		
PCIE2	2	x1	x2	
PCIE3	3	x1		
PCIE4	4 (optional to PCIe Switch)	x1	x2 (opt.)	
PCIE5	5 just with BOM option: noGbEnoPCIEswitch_PcIe5native	x1		

NOTICE

Just five Root Ports are supported at the same time; one is used from the Ethernet controller. 5 x1 configuration is not possible if Ethernet is populated. There are also dependencies between GPP and GFX configuration.

NOTICE

Lane 5 is connected to i210. It is not allowed to use COMe PCIe Port 4 as x1 Port. If this Port is used, Ethernet will not work. A different PCIe configuration have to be selected e.g. Port 4 and Port 5 as a x1 configuration.

2.3.22. General Purpose PCI Express 3.0 (R1000 SKUs)

The R1000 SKU processors support supports 4 or 8 GPP lanes (up to Gen 3), depending of the SKU. R1505G/R1606G SKUs are supporting 4 GPP lanes (plus x4 Gfx)

- ▶ Lane [1:0] is used as COMe PCIe;
- ▶ Lane 4 optionally connected to PCIe Switch
- ▶ Lane 5 is connected to i210, optionally connected to COMe PCIe 5
- ▶ Lane [7:6] are working as SATA only at R1000 SKUs.

Table 37: General Purpose PCI Express 3.0 for R1000 SKUs

COMe connector	GPP Lane	Lane Config	
PCIE0	0	x1	x2
PCIE1	1	x1	
PCIE2	Not supported		
PCIE3	Not supported		
PCIE4	4 (optional to PCIe Switch)	x1	x2 (opt.)
PCIE5	5 just with BOM option: noGbEnoPCIEswitch_PClE5native	x1	

2.3.23. PCIe Switch

The Diodes PI7C9X2G608EL PCIe Gen 2 Packet Switch is optionally connected to PCIe Lane 4 of the V1000/R1000. The Switch can be configured in different modes. The Switch is used in a 6Port-6Lane Configuration (606 mode). The routing is done in a different way, regarding used SKU (V1000 or R1000).

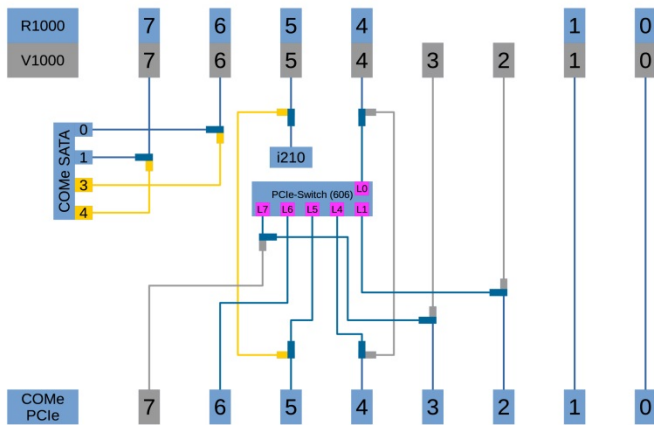
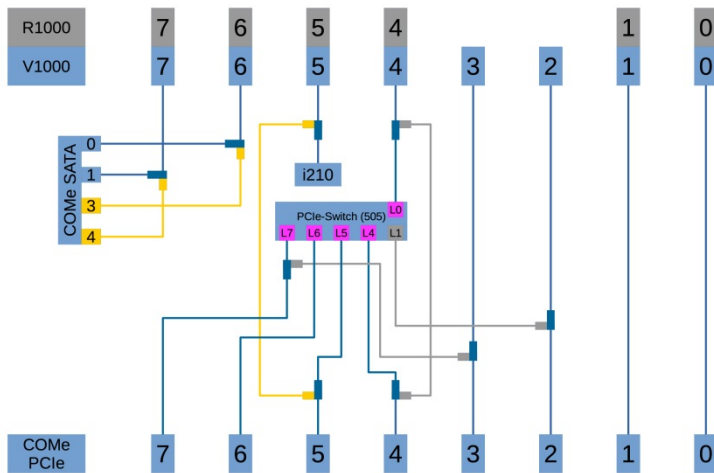
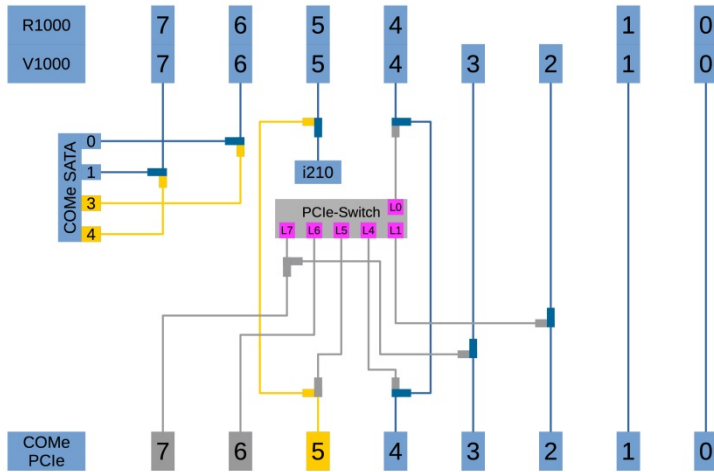
Table 38: PCIe Switch V1000

COMe connector	GPP Lane	Lane Config
PCIE4	4	x1
PCIE5	5	x1
PCIE6	6	x1
PCIE7	7	x1

Table 39: PCIe Switch R1000

COMe connector	GPP Lane	Lane Config
PCIE2	1	x1
PCIE3	7	x1
PCIE4	4	x1
PCIE5	5	x1
PCIE6	6	x1
PCIE7	Not supported	x1

Figure 5: R1000/V1000 PCI Variants



2.3.24. PCI Express Graphics (3.0)

PCIe allows a reversal of the physical lane ordering between the host device and the target device. The requirements are that the lanes are still sequentially ordered but can be logically reversed; for example, on a x4 GFX APU lane 3 connects to dGPU lane 0, APU lane 2 connects to dGPU lane1, APU lane 1 connects to dGPU lane 2, and APU lane 0 connects to dGPU lane 3.

Table 40: PCI Express Graphics (3.0)

COMe connector	GPP Lane	Lane Config	
PEG0	0	x4	x8
PEG1	1		
PEG2	2		
PEG3	3		
PEG4	4	x4	
PEG5	5		
PEG6	6		
PEG7	7		

2.3.25. PCI Express Reference Clock

Table 41: PCI Express Reference Clock

COMe Connector	SoC Pin
PCIE_CK_REF	GPP_CLK0

2.3.26. USB

The SoC offers the following configurations:

- ▶ Up to 4x USB 2.0 (8x USB 2.0 with Option USB-Hub)
- ▶ Up to 3x USB 3.1 10 Gbit/s
- ▶ 1x USB 3.1 5 Gbit/s

Table 42: USB

COMe	SoC USB2	Hub (on Soc port 5)	SoC USB_SS
USB0/USB_SS0	USB_0_P1 (Port 1)		USB_C0_P1 (Port 1)
USB1/USB_SS1	USB_0_P2 (Port 2)		GEN2 (10 Gbit/s) USB_C0_P2 (Port 2) GEN2 (10 Gbit/s)
USB2/USB_SS2	USB_0_P3 (Port 3)		USB_C0_P3 (Port 3) GEN2 (10 Gbit/s) optional, shared with DDI3
USB3/USB_SS3	USB_1_P0 (Port 4)		USB_C1_P0 (Port 4) GEN1 (5 Gbit/s)
USB4		USB2_4 (Port 1)	
USB5	-	USB2_5 (Port 2)	

COMe	SoC USB2	Hub (on Soc port 5)	SoC USB_SS
USB6	-	USB2_6 (Port 3)	
USB7	-	USB2_7 (Port 4)	

NOTICE**USB-SS RX coupling**

USB 3.2 Specification: RX signals may be AC coupled if desired.

COMe Specification: USB SS RX Signals are AC coupled off Module.

NOTICE**AMD Design Guide:**

The USB 3.2 interface requires AC-coupling capacitors (330nF) between the transmitter of one device and the receiver of another device. Carrier Designers should take care about it.

NOTICE

R1505G/R1606G does support USB2/USB_SS2 by default (DDI3 is not supported with R1000 SKUs)

R1505G/R1606G does not support USB_SS3 – USB3 just works as USB 2.0 Port

2.3.27. SATA

The SATA high-speed storage interface supports two SATA Gen3 ports with transfer rates of up to 6 Gb/s.

Table 43: SATA

COMe Port	GPP Lane
SATA0	GPP 6
SATA1	GPP 7
SATA2	BOM option from GPP 6
SATA3	BOM option GPP 7

2.3.28. General Purpose I/Os

In addition to COMe spec, all GPIOs can also be configured as output and all GPOs as inputs.

Table 44: General Purpose I/Os

COMe Signal	EC/kCPLD function
GPIO	pio_gpio[0]
GPI1	pio_gpio[1]
GPI2	pio_gpio[2]
GPI3	pio_gpio[3]
GPO0	pio_gpio[4]
GPO1	pio_gpio[5]
GPO2	pio_gpio[6]
GPO3	pio_gpio[7]

2.3.29. UART Serial Ports

Table 45: UART Serial Ports

COMe Signal	EC/kCPLD function
SER0_TX	po_uart_tx[0]
SER0_RX	po_uart_rx[0]
SER1_TX	po_uart_tx[1]
SER1_RX	po_uart_rx[1]

2.3.30. Ethernet

Ethernet connectivity is achieved via a single-port integrated physical layer (PHY) supporting Ethernet Media Dependent Interfaces [0-3].

Table 46: Ethernet features

Ethernet	10 Base-T, 100 Base-TX and 1000 Base-T
Ethernet Controller	Intel® I210 Ethernet Controller



If the LAN-Cable is disconnected, the ULP (Ultra Low Power) driver featured in Windows 10 can cause undefined LED behavior. To disable ULP use the "Intel ULPenable-Utility 1.3". For more information refer to the EMD Customer Section or contact Kontron Support.

2.3.31. BIOS/Software Features

Table 47: Supported BIOS and Software Features

BIOS EFI	AMI Aptio V UEFI
Software	KeAPI 3.0 for all supported OS BIOS/EFI Flash utility for EFI Shell, Windows, Linux BIOS/EFI utility for customers to implement Boot Logo
Operating System (OS)	Windows 10 (64-bit) Linux 64 bit + LiveCD VxWorks 7.x (64-bit)

2.3.32. COMe Features

Table 48: COM Express® Features

SPI	Boot from an external SPI
LPC	Supported
UART	2x UART (RX/TX)
LID Signals	Supported
Sleep Signals	Supported
Audio	HD Audio for external HAD codecs
SMBus	Supported

2.3.33. Kontron Features

Table 49: Kontron specific Product Features

External I2C Bus	Fast I2C, 100 KHz – 400 kHz, MultiMaster capable
Embedded API	KEAPI3
Custom BIOS Settings / Flash Backup	Supported
Watchdog Support	Dual staged
External SIO	Supported on the base board
GPIO	8x GPIO shared with SDIO, configurable in BIOS setup options
Rapid Shutdown	Not supported

3/ Electrical Specification

3.1.1. Power Supply Voltage Specifications

The COMe-cVR6 supports operation in both single supply power supply mode and ATX power supply mode.



Industrial temperature grade modules are validated for 12 V power supply only.
Commercial temperature grade modules support the wide range 8.5 V to 20 V power supply.

Table 50: Power Supply Specifications

Supply Voltage Range (VCC)	8.5 V to 20 V
Supply Voltage (VCC)	12 V
Standby Voltage	5 V \pm 5%
RTC	2.8 V to 3.47 V



5 V Standby voltage is not mandatory for operation.

3.1.1.1. Power Supply Rise Time

The input voltage rise time is 0.1 ms to 20 ms from input voltage $\leq 10\%$ to nominal VCC. To comply with the ATX specification there must be a smooth and continuous ramp of each DC input voltage from 10% to 90% of the DC input voltage final set point.

3.1.1.2. Power Supply Voltage Ripple

The maximum power supply voltage ripple is 100 mV peak-to-peak at 0 MHz – 20 MHz.

3.1.2. Power Management

Table 51: Power management options

ACPI Settings	ACPI 5.0
Miscellaneous Power Management	Supported in BIOS setup menu

Within the BIOS setup, If VCC power is removed, 5 V $\pm 5\%$ can be applied to the V_5V_STBY pins to support the following suspend-states:

- ▶ Suspend to RAM (S3)
- ▶ Suspend-to-disk / Hibernate (S4)
- ▶ Soft-off state (S5)

The Wake-Up event (S0) requires VCC power, as the board is running.

3.1.3. Power Supply Control Settings

The power Supply control settings are set in the BIOS and enable the module to shut down, rest and wake from standby properly.

Table 52: Implemented Power Supply Control Settings

Power Button (PWRBTN#)	Pin B12	To start the module using the power button, the PWRBTN# signal must be at least 50 ms ($50 \text{ ms} \leq t < 4 \text{ s}$, typical 400 ms) at low level (Power Button Event). Pressing the power button for at least four seconds turns off power to the module (Power Button Override).
Power Good (PWR_OK)	Pin B24	PWR_OK is internally pulled up to 3.3 V and must be at the high level to power on the module. This can be driven low to hold the module from powering up as long as needed. The carrier needs to release the signal when ready. Low level prevents the module from entering the S0 state. A falling edge during S0 will cause a direct switch to S5 (Power Failure).
Reset Button (SYS_RESET#)	Pin B49	When the SYS_RESET# pin is detected active (falling edge triggered), it allows the processor to perform a "graceful" reset, by waiting up to 25 ms for the SMBus to go idle before forcing a reset, even though activity is still occurring. Once the reset is asserted, it remains asserted for 5 ms to 6 ms regardless of whether the SYS_RESET# input remains asserted or not.
SM-Bus Alert (SMB_ALERT#)	Pin B15	With an external battery manager present and SMB_ALERT #connected, the module always powers on even if the BIOS switch "After Power Fail" is set to "Stay Off".

3.1.4. Power Supply Modes

Setting the power supply controls enables the COMe-cVR6 to operating in either ATX power mode or in single power supply mode.

3.1.4.1. ATX Mode

To start the module in ATX mode and power VCC, follow the steps below.

1. Connect the ATX PSU with VCC and 5 VSB to set PWR_OK to low and VCC to 0 V.
2. Press the power button to set the PWR_OK to high and power VCC.

The PS_ON# signal, generated by SUS_S3# (A15), indicates that the system is in the Suspend to RAM state. An inverted copy of SUS_S3# on the carrier board may be used to enable non-standby power on a typical ATX supply. The input voltage must always be higher than 5 V standby ($VCC > 5 \text{ VSB}$) for Computer-On-Modules supporting a wide input voltage range down to 8.5 V.

Table 53: ATX Mode Settings

State	PWRBTN#	PWR_OK	V5_StdBy	PS_ON#	VCC
G3	x	x	0V	x	0 V
S5	high	low	5V	high	0 V
S5 → S0	PWRBTN Event	low → high	5V	high → low	0 V → VCC
S0	high	high	5V	low	VCC

x – Signals are not relevant for the specific power state. It makes no difference if the signal is connected or open.

3.1.5. Single Supply Mode

In single supply mode, without 5 V standby, the module starts automatically if VCC power is connected and Power Good input is open or at the high level (internal pull up (PU) to 3.3 V).

PS_ON# is not used in single supply mode and the input voltage VCC range can be 8.5 V to 20 V.

To power on the module from S5 state, press the power button or reconnect VCC. Suspend/Standby states are not supported in single supply mode.

Table 54: Single Supply Mode Settings

State	PWRBTN#	PWR_OK	V5_StdBy	VCC
G3	x / 0 V	x / 0 V	x / 0 V	0 V
G3 → S0	high	open / high	open	connecting VCC
S5	high	open / high	open	VCC
S5 → S0	PWRBTN Event	open / high	open	reconnecting VCC

x – Signals are not relevant for the specific power state. It makes no difference if the signal is connected or open.



All ground pins must be connected to the carrier board's ground plane.

4/ Thermal Management

4.1.1. Heatspreader and Active or Passive Cooling Solutions

A heatspreader plate assembly is available from Kontron for the COMe-cVR6. The heatspreader plate assembly is NOT a heat sink. The heatspreader works as a COM Express® standard thermal interface to be use with a heat sink or external cooling devices.

External cooling must be provided to maintain the heatspreader plate at proper operating temperatures. Under worst-case conditions, the cooling mechanism must maintain an ambient air and heatspreader plate temperature on any spot of the heatspreader's surface according to the module specifications:

- ▶ 60°C for commercial temperature grade modules
- ▶ 75°C for extended temperature grade modules (E1)
- ▶ 85°C for industrial temperature grade modules by screening (E2S)

4.1.2. Active or Passive Cooling Solutions

Both active and passive thermal management approaches can be used with heatspreader plates. The optimum cooling solution varies, depending on the COM Express® application and environmental conditions. Active or passive cooling solutions provided from Kontron for the COMe-cVR6 are usually designed to cover the power and thermal dissipation for a commercial temperature range used in housing with proper airflow. For more information concerning possible cooling solutions, see Chapter 2.2 Accessories.

4.1.3. Operating with Kontron Heatspreader Plate (HSP) Assembly

The operating temperature defines two requirements:

- ▶ Maximum ambient temperature with ambient being the air surrounding the module
- ▶ Maximum measurable temperature on any spot on the heatspreader's surface

The heatspreader is tested for the following temperature specifications.

Table 55: Heatspreader Test Temperature Specifications

Temperature Specification	Validation Requirements
Commercial Grade	at 60°C HSP temperature the CPU @ 100% load needs to run at nominal frequency
Extended Grade (E1)	at 75°C HSP temperature the CPU @ 75% load is allowed to start speedstepping for thermal protection
Industrial Grade by screening (E2S)	at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection

4.1.4. Operating without Kontron Heatspreader Plate (HSP) Assembly

The operating temperature is the maximum measurable temperature on any spot on the module's surface.

5/ Environmental Specification

5.1.1. Temperature

Kontron defines the following temperature grades for Computer-On-Modules. For more information on the available temperature grades for the COMe-cVR6, see Chapter 2.1 Module Variants.

Table 56: Temperature Grade Specifications

Temperature Grades	Operating	Non-operating / Storage
Commercial Grade	0°C to +60°C	-30°C to +85°C
Extended Grade E1 (custom)	-25°C to +75°C	-30°C to +85°C
Industrial Grade E2S (by screening)	-40°C to +85°C	-40°C to +85°C

5.1.2. Humidity

Table 57: Humidity Specification

Humidity	
Relative Humidity	93% at 40°C non-condensing (according to IEC 60068-2-78)

5.2. Standards and Certifications

The COMe-cVR6 complies with the following standards and certifications. For more information, contact Kontron Support.

Table 58: Standards and Certification Compliance

Standard	Definition
Emission (EMC)	EN 55022: Class B: Information technology equipment – Radio disturbance characteristics- Limits and methods of measurement IEC /EN 61000-6-3 :Electromagnetic compatibility (EMC)- Part 6-3: Generic Standards- Emission standard for residential, commercial and light-industrial environments IEC/ EN 61000-3-2: Harmonic current emissions IEC / EN 61000-3-3: Voltage changes, voltage fluctuations and flicker
Immunity (EMI)	IEC / EN 61000-6-2: Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – immunity for industrial environments Immunity tests: IEC / EN 61000-4-2 – Electrostatic discharge immunity (ESD) IEC / EN 61000-4-3 – Radiated, radio frequency, electromagnetic field immunity IEC / EN 61000-4-4 – Electrical fast transient/burst immunity IEC / EN 61000-4-5 – Surge immunity IEC / EN 61000-4-6 – Immunity to conducted disturbances, induced by radio frequency fields IEC / EN 61000-4-8 – Power frequency magnetic field Immunity IEC / EN 61000-4-11 – Voltage dips, short interruptions, & voltage variation immunity

Standard	Definition
Safety	EN 62368-1 Safety for audio/video and information technology equipment
UL	UL 60950-1/CSA 60950-1 Component Recognition Recognized by Underwriters Laboratories Inc. Representative samples of this component have been evaluated by UL and meet applicable UL requirements. UL listings: AZOT2.E147705 AZOT8.E147705
Shock	IEC / EN 60068-2-27 Non-operating shock – (half-sinusoidal, 11 ms, 15 g)
Vibration	IEC/EN 60068-2-6 Non-operating vibration – (sinusoidal, 10 Hz – 4000 Hz, +/- 0.15 mm, 2 g)
Theoretical MTBF	704245 @ 40°C
(RoHS II)	Compliant with the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

6/ Mechanical Specification

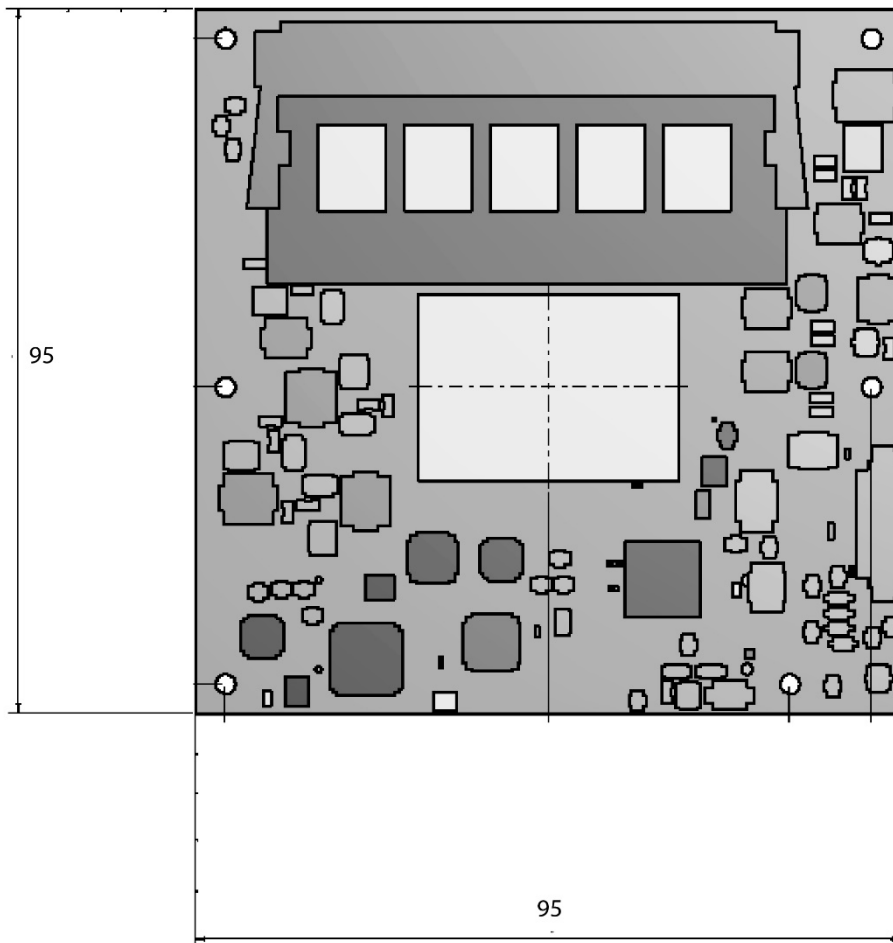
6.1.1. Dimensions

The dimensions of the module are:

- ▶ 95.0 mm x 95.0 mm (3.75 " x 3.75 ")

Figure 6: Module Dimensions

*All dimensions shown in mm.

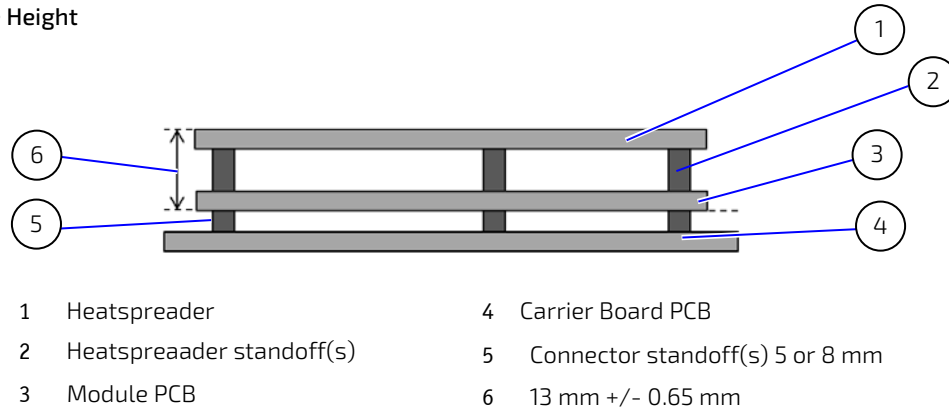


6.1.2. Height

The height of the module depends on the height of the implemented cooling solution. The height of the cooling solution is not specified in the COM Express® specification.

The COM Express® specification defines a module height of approximately 13 mm from module PCB bottom to heatspreader top, as shown in Figure 7: Module Height below.

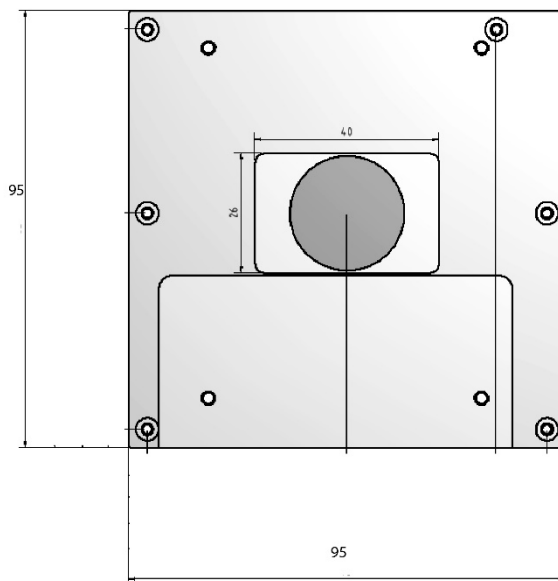
Figure 7: Module Height



6.1.3. Heatspreader Dimension

The following figure shows the heatspreader's dimensions and location on the module.

Figure 8: Heatspreader Location and Dimensions



*All dimensions shown in mm.

7/ Features and Interfaces

7.1. LPC

The Low Pin Count (LPC) interface signals are connected to the LPC bus bridge located in the CPU or chipset. The LPC low speed interface can be used for peripheral circuits such as an external Super I/O controller that typically combines legacy-device support into a single IC. The implementation of this subsystem complies with the COM Express® specification. The COM Express® Design Guide maintained by PICMG provides implementation information or refer to the official PICMG documentation for more information.

The LPC bus does not support DMA (Direct Memory Access). When more than one device is used on LPC, a zero delay clock buffer is required. This leads to limitations for ISA bus and SIO (standard I/O(s) like floppy or LPT interfaces) implementations.

All Kontron COM Express® Computer-On-Modules imply BIOS support for the following external baseboard LPC Super I/O controller features for the Winbond/Nuvoton 3.3V 83627DHG-P.

Table 59: Supported BIOS Features

Winbond/Nuvoton 3.3V 83627DHG-P	AMI EFI APTIO V
PS/2	Not supported
COM1/COM2	Supported
LPT	Not supported
HWM	Not supported
Floppy	Not supported
GPIO	Not supported

Features marked as not supported do not exclude OS support (e.g., HWM is accessible via SMB). If any other LPC Super I/O additional BIOS implementations are necessary then contact Kontron Support.

7.2. Serial Peripheral Interface (SPI)

The Serial Peripheral Interface Bus (SPI bus) is a synchronous serial data link standard. Devices communicate in master/slave mode, where the master device initiates the data frame. Multiple slave devices are allowed with individual slave select (chip select) lines. SPI is sometimes called a four-wire serial bus, contrasting with three, two and one-wire serial buses.



The SPI interface can only be used with a SPI flash device to boot from the external BIOS on the baseboard.

7.2.1. SPI Boot

The COMe-cVR6 supports boot from an external SPI Flash. Pin A34 (BIOS_DIS0#) and pin B88 (BIOS_DIS1#) configure the SPI Flash as follows:

Table 60: SPI Boot Pin Configuration

Configuration	BIOS_DIS0#	BIOS_DIS1#	Function
1	open	open	Boot on module BIOS
2	GND	open	Not supported
3	open	GND	Boot on baseboard SPI
4	GND	GND	Not supported



BIOS does not support being split between two chips. Booting takes place either from the module SPI or from the baseboard SPI.

Table 61: Supported SPI Boot Flash Types for 8-SOIC Package

Size	Manufacturer	Part Number	Device ID
8 MB	Macronix	MX25L6406E	0x20

7.3. Fast I2C

Fast I2C supports transfer between components on the same board. The COMe-cVR6 features an onboard I2C controller connected to the LPC Bus.

The I2C controller supports:

- ▶ Multimaster transfers
- ▶ Clock stretching
- ▶ Collision detection
- ▶ Interruption on completion of an operation

7.4. UART

The UART implements an interface for serial communications and supports up to two serial RX/TX ports defined in the COM Express® specification on pins A98 (SER0_TX) /A99 (SER0_RX) for UART0 and pins A101 (SER1_TX)/A102 (SER1_RX) for UART1. The UART controller is fully 16550A compatible.

Features of the UART are:

- ▶ On-Chip bit rate (baud rate) generator
- ▶ No handshake lines
- ▶ Interrupt function to the host
- ▶ FIFO buffer for incoming and outgoing data

7.5. Dual Staged Watchdog Timer (WTD)

A watchdog timer or (computer operating properly (COP) timer) is a computer hardware or software timer. If there is a fault condition in the main program, the watchdog triggers a system reset or other corrective actions. The intention is to bring the system back from the non-responsive state to normal operation.

Possible fault conditions are a hang or neglecting to service the watchdog regularly. Such as writing a "service pulse" to it, also referred to as "kicking the dog", "petting the dog", "feeding the watchdog" or "triggering the watchdog").

The COMe-cVR6 offers a watchdog that works with two stages that can be programmed independently and used stage by stage.

Table 62: Dual Stage Watchdog Timer- Time-out Events

Status	Events	Definition
0000b	No action	The stage is off and will be skipped.
0001b	Reset	A reset restarts the module and starts a new POST and operating system.
0010b	NMI	A non-maskable interrupt (NMI) is a computer processor interrupt that cannot be ignored by standard interrupt masking techniques in the system. It is used typically to signal attention for non-recoverable hardware errors.
0011b	SMI	A system management interrupt (SMI) makes the processor entering the system management mode (SMM). As such, specific BIOS code handles the interrupt. The current BIOS handler for the watchdog SMI currently does nothing. For special requirements, contact Kontron Support.
0100b	SCI	A system control interrupt (SCI) is a OS-visible interrupt to be handled by the OS using AML code.
0101b	Delay -> No action*	Might be necessary when an operating system must be started and the time for the first trigger pulse must be extended. Only available in the first stage.
1000b	WDT Only	This setting triggers the WDT pin on the baseboard connector (COM Express® pin B27) only.
1001b	Reset + WDT	
1010b	NMI + WDT	
1011b	SMI + WDT	
1100b	SCI + WDT	
1101b	DELAY + WDT -> No action*	

7.5.1. WDT Signal

Watchdog time-out event (pin B27) on COM Express® connector offers a signal that can be asserted when a watchdog timer has not been triggered with a set time. The WDT signal is configurable to any of the two stages. After reset, the signal is automatically deasserted. If deassertion is necessary during runtime, ask Kontron Support for further help.

7.6. Real Time Clock (RTC)

The RTC keeps track of the current time accurately. The RTC's low power consumption means that the RTC can be powered from an alternate source of power enabling the RTC to continue to keep time while the primary source of power is off or unavailable.

The RTC battery voltage range is 2.8 V to 3.47 V. A typical RTC voltage is 3 V with a current of >3 µA. If the module is powered by the mains supply the RTC voltage is generated by on-module regulators to reduce the RTC current draw.

7.7. GPIO

The eight GPIO pins support four inputs pins (A54 for GPIO, A63 for GPI1, A67 for GPI2 and A85 for GPI3) and four output pins (A93 for GPO0, B54 for GPO1, B57 for GPO2 and B63 for GPO3) by default. The four GPI [0-3] pins are pulled high with a pull-up resistor (e.g. 100 K ohms) and the four GPO [0-3] pins are pulled low with a pull-down resistor (e.g. 100 K ohms) on the module.

To change the default GPIO signal-state users are required to make BIOS and/or OS-driver changes, and additional hardware changes by adding external termination resistors on the carrier board to override the weak on-module pull-up resistors with a lower resistance pull-down (e.g. 10 K ohms), or pull-down resistors with a lower resistance pull-up (e.g. 10 K ohms).

7.8. Trusted Platform Module (TPM 2.0)

A Trusted Platform Module (TPM) stores RSA encryption keys specific to the host system for hardware authentication. The term TPM refers to the set of specifications applicable to TPM chips. The LPC bus connects the TPM chip to the CPU.

Each TPM chip contains an RSA key pair called the Endorsement Key (EK). The pair is maintained inside the chip and cannot be accessed by software. The Storage Root Key (SRK) is created when a user or administrator takes ownership of the system. This key pair is generated by the TPM based on the Endorsement Key and an owner-specified password.

A second key, called an Attestation Identity Key (AIK) protects the device against unauthorized firmware and software modification by hashing critical sections of firmware and software before they are executed. When the system attempts to connect to the network, the hashes are sent to a server that verifies that they match the expected values. If any of the hashed components have been modified since the last start, the match fails, and the system cannot gain entry to the network.

7.9. Kontron Security Solution

Kontron Security Solution is a combined hardware and software solution that includes an embedded hardware security module and a software framework to provide full protection for your application.

The COMe-cVR6 includes an integrated security module connected to USB2 port 9, supporting the following features:

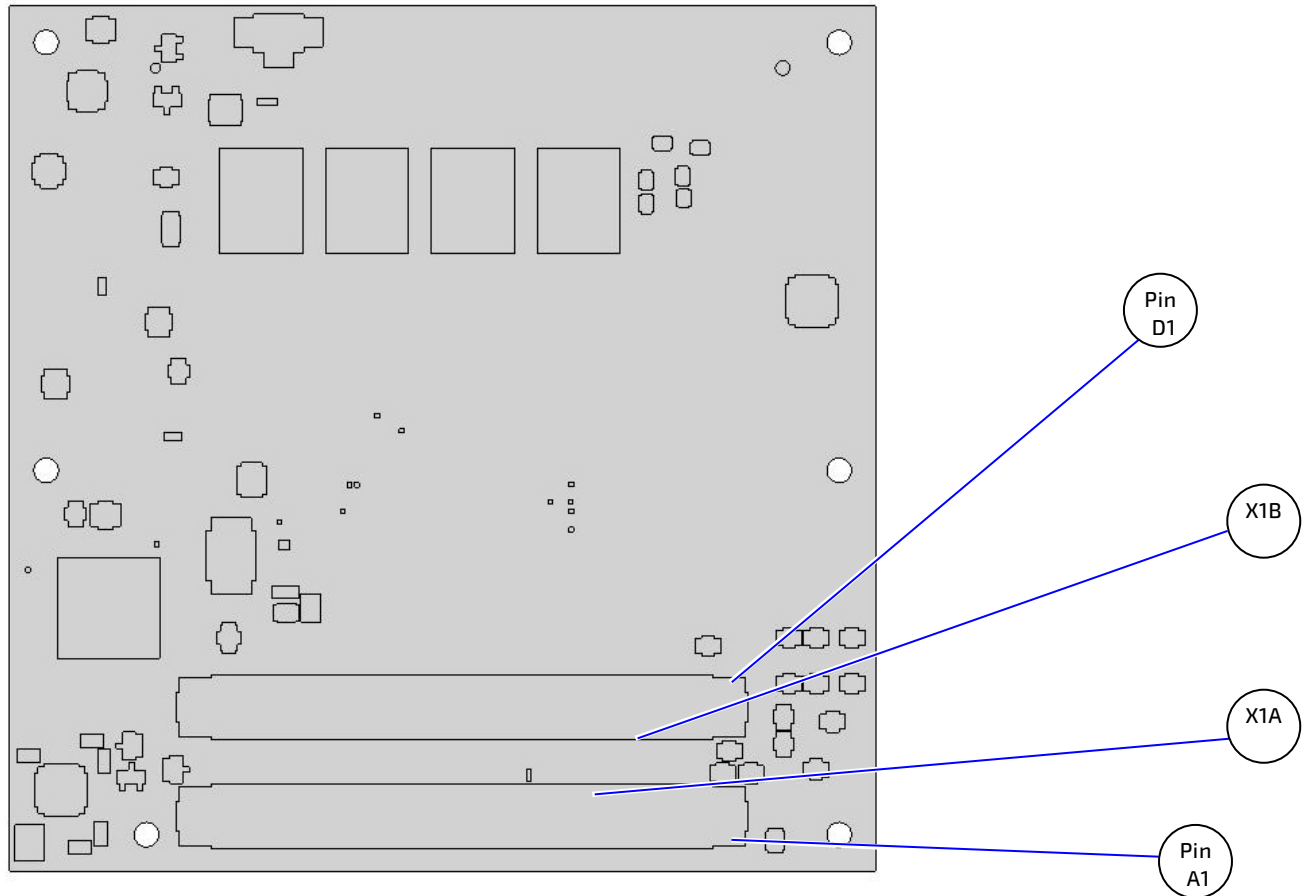
- ▶ Copy protection
- ▶ IP protection
- ▶ License model enforcement

If required customers can customize the solution to meet specific needs. For more information, contact Kontron Support.

8/ COMe Interface Connectors (X1A and X1B)

The COMe-cVR6 is a COM Express® compact module containing two 220-pin connectors; each with two rows called row A & B on the primary connector and row C & D on the secondary connector.

Figure 9: X1A and X1B COMe Interface Connectors



8.1. X1A and X1B Signals

For a description of the terms used in the X1A and X1B pin assignment tables, see Table 63: General Signal Description or Appendix A, List of Acronyms. If a more detailed pin assignment description is required, refer to the PICMG specification COMe Rev 3.0 Type 6 standard.



The information provided under type, module terminations and comments is complementary to the COM.0 Rev 3.0 Type 6 standard. For more information, contact Kontron Support.

Table 63: General Signal Description

Type	Description	Type	Description
NC	Not Connected (on this product)	O-1,8	1.8 V Output
I/O-3,3	Bi-directional 3.3 V I/O-Signal	O-3,3	3.3 V Output
I/O-5T	Bi-dir. 3.3 V I/O (5 V Tolerance)	O-5	5 V Output
I/O-5	Bi-directional 5V I/O-Signal	DP-I/O	Differential Pair Input/Output
I-3,3	3.3 V Input	DP-I	Differential Pair Input
I/OD	Bi-directional Input/Output Open Drain	DP-O	Differential Pair Output
I-5T	3.3 V Input (5 V tolerance)	PU	Pull-Up Resistor
OA	Output Analog	PWR	Power Connection
OD	Output Open Drain	+ and -	Differential Pair

NOTICE

To protect external power lines of peripheral devices, make sure that: the wires have the right diameter to withstand the maximum available current.

The enclosure of the peripheral device fulfills the fire-protection requirements of IEC/EN60950.

8.2. X1A and X1B Pin Assignment

For more information regarding the pin assignment of connector X1A (Row A and Row B) and connector X1B (Row C and Row D), see the pin assignment tables:

1. Table 64: Connector X1A Row A Pin Assignment (A1- A110)
2. Table 65: Connector X1A Row B Pin Assignment (B1-B110)
3. Table 66: Connector X1B Row C Pin Assignment (C1-C110)
4. Table 67: Connector X1B Row D Pin Assignment (D1-D110)

8.2.1. Connector X1A Row A1 – A110

Table 64: Connector X1A Row A Pin Assignment (A1- A110)

Pin	Signal	Description	Type	Termination	Comment
A1	GND	Power Ground	PWR GND	---	---
A2	GBE0_MDI3-	Ethernet Media Dependent Interface 3 -	DP-I/O	---	---
A3	GBE0_MDI3+	Ethernet Media Dependent Interface 3 +	DP-I/O	---	---
A4	GBE0_LINK100#	Ethernet Speed LED	OD	---	---
A5	GBE0_LINK1000#	Ethernet Speed LED	OD	---	---
A6	GBE0_MDI2-	Ethernet Media Dependent Interface 2 -	DP-I/O	---	---
A7	GBE0_MDI2+	Ethernet Media Dependent Interface 2 +	DP-I/O	---	---
A8	GBE0_LINK#	LAN Link LED	OD	---	---
A9	GBE0_MDI1-	Ethernet Media Dependent Interface 1 -	DP-I/O	---	---
A10	GBE0_MDI1+	Ethernet Media Dependent Interface 1 +	DP-I/O	---	---
A11	GND	Power Ground	PWR GND	---	---
A12	GBE0_MDI0-	Ethernet Media Dependent Interface 0 -	DP-I/O	---	---
A13	GBE0_MDI0+	Ethernet Media Dependent Interface 0 +	DP-I/O	---	---
A14	GBE0_CTREF	Center Tab Reference Voltage	0	---	100nF capacitor to GND
A15	SUS_S3#	Suspend To RAM (or deeper) Indicator	0-3.3	PD 10k	---
A16	SATA0_TX+	SATA Transmit Pair 0 +	DP-0	---	---
A17	SATA0_TX-	SATA Transmit Pair 0 -	DP-0	---	---
A18	SUS_S4#	Suspend To Disk (or deeper) Indicator	0-3.3	PD 10k	---
A19	SATA0_RX+	SATA Receive Pair 0 +	DP-I	---	---
A20	SATA0_RX-	SATA Receive Pair 0 -	DP-I	---	---
A21	GND	Power Ground	PWR GND	---	---
A22	SATA2_TX+	SATA Transmit Pair 2 +	DP-0	---	---
A23	SATA2_TX-	SATA Transmit Pair 2 -	DP-0	---	---
A24	SUS_S5#	Soft Off Indicator	0-3.3	PD 10k	---
A25	SATA2_RX+	SATA Receive Pair 2 +	DP-I	---	---
A26	SATA2_RX-	SATA Receive Pair 2 -	DP-I	---	---
A27	BATLOW#	Battery Low	I-3.3	PU 3.3V (S5)	assertion will prevent wake from S3-S5 state
A28	(S)ATA_ACT#	Serial ATA activity LED	OD-3.3	PU 10k 3.3V (S0)	---

Pin	Signal	Description	Type	Termination	Comment
A29	HDA_SYNC	HD Audio Sync	0-3.3	---	Levelshifter TXB0108
A30	HDA_RST#	HD Audio Reset	0-3.3	---	Levelshifter TXB0108
A31	GND	Power Ground	PWR GND	---	---
A32	HDA_CLK	HD Audio Bit Clock Output	0-3.3	---	---
A33	HDA_SDOOUT	HD Audio Serial Data Out	0-3.3	---	---
A34	BIOS_DISO#/ESPI _SAFS	BIOS Selection Strap 0	I-3.3	PU 10k 3.3V (S5)	---
A35	THRMTRIP#	Thermal Trip	IO33-OD	PU 1k 3.3V (S0)	---
A36	USB6-	USB 2.0 Data Pair Port 6 -	DP-I/O	PD 14.25k to 24.8k	-
A37	USB6+	USB 2.0 Data Pair Port 6 +	DP-I/O	PD 14.25k to 24.8k	---
A38	USB_6_7_OC#	USB Overcurrent Indicator Port 6/7	I-3.3	PU 10k 3.3V (S5)	---
A39	USB4-	USB 2.0 Data Pair Port 4 -	DP-I/O	PD 14.25k to 24.8k	---
A40	USB4+	USB 2.0 Data Pair Port 4 +	DP-I/O	PD 14.25k to 24.8k	---
A41	GND	Power Ground	PWR GND	---	---
A42	USB2-	USB 2.0 Data Pair Port 2 -	DP-I/O	PD 14.25k to 24.8k	---
A43	USB2+	USB 2.0 Data Pair Port 2 +	DP-I/O	PD 14.25k to 24.8k	---
A44	USB_2_3_OC#	USB Overcurrent Indicator Port 2/3	I-3.3	PU 10k 3.3V (S5)	---
A45	USB0-	USB 2.0 Data Pair Port 0 -	DP-I/O	PD 14.25k to 24.8k	---
A46	USB0+	USB 2.0 Data Pair Port 0 +	DP-I/O	PD 14.25k to 24.8k	---
A47	VCC_RTC	Real-Time Clock Circuit Power Input	PWR 3V	---	voltage range 2.8-3.47V
A48	RSVD	Reserved for future use	nc	---	---
A49	GBE0_SDP	Gigabit Ethernet Controller 0 Software-Definable Pin	I/O-3.3	---	---
A50	LPC_SERIRQ/ESPI _CS1#	Serial Interrupt Request / eSPI Master Chip Select 1	IO33-OD	PU 8k2 3.3V (S0)	---
A51	GND	Power Ground	PWR GND	---	---
A52	PCIE_TX5+	PCI Express Lane 5 Transmit +	DP-0	---	---
A53	PCIE_TX5-	PCI Express Lane 5 Transmit -	DP-0	---	---
A54	GPIO	General Purpose Input 0	I-3.3	PU 100k 3.3V (S0)	---
A55	PCIE_TX4+	PCI Express Lane 4 Transmit +	DP-0	---	---
A56	PCIE_TX4-	PCI Express Lane 4 Transmit -	DP-0	---	---
A57	GND	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
A58	PCIE_TX3+	PCI Express Lane 3 Transmit +	DP-0	---	---
A59	PCIE_TX3-	PCI Express Lane 3 Transmit -	DP-0	---	---
A60	GND	Power Ground	PWR GND	---	---
A61	PCIE_TX2+	PCI Express Lane 2 Transmit +	DP-0	---	---
A62	PCIE_TX2-	PCI Express Lane 2 Transmit -	DP-0	---	---
A63	GPI1	General Purpose Input 1	I-3.3	PU 100k 3.3V (S0)	---
A64	PCIE_TX1+	PCI Express Lane 1 Transmit +	DP-0	---	---
A65	PCIE_TX1-	PCI Express Lane 1 Transmit -	DP-0	---	---
A66	GND	Power Ground	PWR GND	---	---
A67	GPI2	General Purpose Input 2	I-3.3	PU 100k 3.3V (S0)	---
A68	PCIE_TX0+	PCI Express Lane 0 Transmit +	DP-0	---	---
A69	PCIE_TX0-	PCI Express Lane 0 Transmit -	DP-0	---	---
A70	GND	Power Ground	PWR GND	---	---
A71	LVDS_A0+	LVDS Channel A DAT0+ / EDP Lane 2 Transmit +	DP-0	---	---
A72	LVDS_A0-	LVDS Channel A DAT0- / EDP Lane 2 Transmit -	DP-0	---	---
A73	LVDS_A1+	LVDS Channel A DAT1+ / EDP Lane 1 Transmit +	DP-0	---	---
A74	LVDS_A1-	LVDS Channel A DAT1- / EDP Lane 1 Transmit -	DP-0	---	---
A75	LVDS_A2+	LVDS Channel A DAT2+ / EDP Lane 0 Transmit +	DP-0	---	---
A76	LVDS_A2-	LVDS Channel A DAT2- / EDP Lane 0 Transmit -	DP-0	---	---
A77	LVDS_VDD_EN	LVDS / EDP Panel Power Control	O-3.3	PD 100k	---
A78	LVDS_A3+	LVDS Channel A DAT3+	DP-0	---	---
A79	LVDS_A3-	LVDS Channel A DAT3-	DP-0	---	---
A80	GND	Power Ground	PWR GND	---	---
A81	LVDS_A_CK+	LVDS Channel A Clock+ / EDP Lane 3 Transmit +	DP-0	---	Clock: 20-80MHz
A82	LVDS_A_CK-	LVDS Channel A Clock- / EDP Lane 3 Transmit -	DP-0	---	Clock: 20-80MHz
A83	LVDS_I2C_CK	LVDS I2C Clock (DDC) / EDP AUX +	I/O-3.3	PU 2k2 3.3V (S0)	---
A84	LVDS_I2C_DAT	LVDS I2C Data (DDC) / EDP AUX -	I/O-3.3	PU 2k2 3.3V (S0)	---
A85	GPI3	General Purpose Input 3	I-3.3	PU 100k 3.3V (S0)	---
A86	RSVD	Reserved for future use	nc	---	---
A87	eDP_HPD	EDP Hot Plug Detect	I-3.3	PD 400k LVDS / 100k EDP	---
A88	PCIE_CLK_REF+	Reference PCI Express Clock +	DP-0	---	100MHz

Pin	Signal	Description	Type	Termination	Comment
A89	PCIE_CLK_REF-	Reference PCI Express Clock -	DP-0	---	100MHz
A90	GND	Power Ground	PWR GND	---	---
A91	SPI_POWER	3.3V Power Output Pin for external SPI flash	O-3.3	---	100mA (max.)
A92	SPI_MISO	SPI Master IN Slave OUT	I-3.3		---
A93	GPO0	General Purpose Output 0	O-3.3	PD 100k	---
A94	SPI_CLK	SPI Clock	O-3.3	---	---
A95	SPI_MOSI	SPI Master Out Slave In	O-3.3	---	---
A96	TPM_PP	TPM Physical Presence	I-3.3	PD 10k	TPM does not use this functionality
A97	TYPE10#	Indicates TYPE10# to carrier board	nc	---	---
A98	SER0_TX	Serial Port 0 TXD	O-3.3	---	20V protection circuit implemented on module
A99	SER0_RX	Serial Port 0 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A100	GND	Power Ground	PWR GND	---	---
A101	SER1_TX	Serial Port 1 TXD	O-3.3	---	20V protection circuit implemented on module
A102	SER1_RX	Serial Port 1 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A103	LID#	LID Switch Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
A104	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A105	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A106	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A107	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A108	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A109	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A110	GND	Power Ground	PWR GND	---	---

+ and - Differential pair differentiator

8.2.2. Connector X1A Row B 1 - B 110

Table 65: Connector X1A Row B Pin Assignment (B1-B110)

Pin	Signal	Description	Type	Termination	Comment
B1	GND	Power Ground	PWR GND	---	---
B2	GBE0_ACT#	Ethernet Activity LED	OD	---	---
B3	LPC_FRAME#/ ESPI_CS0	LPC Frame Indicator / eSPI Master Chip Select 0	0-3.3	---	TBD
B4	LPC_AD0/ ESPI_IO_0	LPC Multiplexed Command, Address & Data 0 / eSPI Master Data I/O 0	I/O-3.3	TBD	---
B5	LPC_AD1/ ESPI_IO_1	LPC Multiplexed Command, Address & Data 1 / eSPI Master Data I/O 1	I/O-3.3	TBD	---
B6	LPC_AD2/ ESPI_IO_2	LPC Multiplexed Command, Address & Data 2 / eSPI Master Data I/O 2	I/O-3.3	TBD	---
B7	LPC_AD3/ ESPI_IO_3	LPC Multiplexed Command, Address & Data 3 / eSPI Master Data I/O 3	I/O-3.3	TBD	---
B8	LPC_DRQ0#/ ESPI_ALERT0#	LPC Serial DMA/Master Request 0/eSPI Alert 0	I-3.3	PU 10k 3.3V	---
B9	LPC_DRQ1#/ ESPI_ALERT1#	Not connected	nc	---	---
B10	LPC_CLK/ ESPI_CK	24MHz LPC clock	0-3.3	TBD	33MHz
B11	GND	Power Ground	PWR GND	---	---
B12	PWRBTN#	Power Button	I-3.3	PU 10k 3.3V (S5)	---
B13	SMB_CLK	SMBUS Clock	0-3.3	PU 3k74 3.3V (S5)	---
B14	SMB_DAT	SMBUS Data	I/O-3.3	PU 3k74 3.3V (S5)	---
B15	SMB_ALERT#	SMBUS Alert	0-3.3	PU 10k 3.3V (S5)	---
B16	SATA1_TX+	SATA 1 Transmit Pair +	DP-0	---	---
B17	SATA1_TX-	SATA 1 Transmit Pair -	DP-0	---	---
B18	SUS_STAT#/ ESPI_RESET#	Suspend Status / eSPI Reset	0-3.3	PD 10k	---
B19	SATA1_RX+	SATA 1 Receive Pair +	DP-I	---	---
B20	SATA1_RX-	SATA 1 Receive Pair -	DP-I	---	---
B21	GND	Power Ground	PWR GND	---	---
B22	SATA3_TX+	SATA 3 Transmit Pair +	DP-0	---	Only on SATA2_3Option
B23	SATA3_TX-	SATA 3 Transmit Pair -	DP-0	---	Only on SATA2_3Option
B24	PWR_OK	Power OK	I-5T	PU 61k 3.3V	20V protection circuit implemented on module
B25	SATA3_RX+	SATA 3 Receive Pair +	DP-I	---	Only on SATA2_3Option

Pin	Signal	Description	Type	Termination	Comment
B26	SATA3_RX-	SATA 3 Receive Pair -	DP-I	---	Only on SATA2_3Option
B27	WDT	Watch Dog Time-Out event	O-3.3	PD 10K	---
B28	HDA_SDIN2	Not Connected	I-3.3	---	---
B29	HDA_SDIN1	Audio Codec Serial Data in 1	I-3.3	---	---
B30	HDA_SDIN0	Audio Codec Serial Data in 0	I-3.3	---	---
B31	GND	Power Ground	PWR GND	---	---
B32	SPKR	Speaker	O-3.3	---	---
B33	I2C_CK	I2C Clock	O-3.3	PU 2k21 3.3V (S5)	---
B34	I2C_DAT	I2C Data	I/O-3.3	PU 2k21 3.3V (S5)	---
B35	THRM#	Over Temperature Input	I-3.3	PU 10k 3.3V (S0)	---
B36	USB7-	USB 2.0 Data Pair Port 7 -	DP-I/O	PD 14.25k to 24.8k	---
B37	USB7+	USB 2.0 Data Pair Port 7 +	DP-I/O	PD 14.25k to 24.8k	---
B38	USB_4_5_OC#	USB Overcurrent Indicator Port 4/5	I-3.3	PU 10k 3.3V (S5)	---
B39	USB5-	USB 2.0 Data Pair Port 5 -	DP-I/O	PD 14.25k to 24.8k	---
B40	USB5+	USB 2.0 Data Pair Port 5 +	DP-I/O	PD 14.25k to 24.8k	---
B41	GND	Power Ground	PWR GND	---	---
B42	USB3-	USB 2.0 Data Pair Port 3 -	DP-I/O	PD 14.25k to 24.8k	---
B43	USB3+	USB 2.0 Data Pair Port 3 +	DP-I/O	PD 14.25k to 24.8k	---
B44	USB_0_1_OC#	USB Overcurrent Indicator Port 0/1	I-3.3	PU 10k 3.3V (S5)	---
B45	USB1-	USB 2.0 Data Pair Port 1 -	DP-I/O	PD 14.25k to 24.8k	---
B46	USB1+	USB 2.0 Data Pair Port 1 +	DP-I/O	PD 14.25k to 24.8k	---
B47	ESPI_EN#	Enable/Disable ESPI- Mode/LPC- Mode	I-3.3	PU 20k 3.3V (S5)	---
B48	USB_HOST_PRSENT	Not Connected	nc	---	---
B49	SYS_RESET#	Reset Button Input	I-3.3	PU 10k 3.3V (S5)	---
B50	CB_RESET#	Carrier Board Reset	O-3.3	---	---
B51	GND	Power Ground	PWR GND	---	---
B52	PCIE_RX5+	PCI Express Lane 5 Receive +	DP-I	---	Only on PCIe_SW Option
B53	PCIE_RX5-	PCI Express Lane 5 Receive -	DP-I	---	Only on PCIe_SW Option

Pin	Signal	Description	Type	Termination	Comment
B54	GP01	General Purpose Output 1	O-3.3	PD 100k	---
B55	PCIE_RX4+	PCI Express Lane 4 Receive +	DP-I	---	---
B56	PCIE_RX4-	PCI Express Lane 4 Receive -	DP-I	---	---
B57	GP02	General Purpose Output 2	O-3.3	PD 100k	---
B58	PCIE_RX3+	PCI Express Lane 3 Receive +	DP-I	---	---
B59	PCIE_RX3-	PCI Express Lane 3 Receive -	DP-I	---	---
B60	GND	Power Ground	PWR GND	---	---
B61	PCIE_RX2+	PCI Express Lane 2 Receive +	DP-I	---	---
B62	PCIE_RX2-	PCI Express Lane 2 Receive -	DP-I	---	---
B63	GP03	General Purpose Output 3	O-3.3	PD 100k	---
B64	PCIE_RX1+	PCI Express Lane 1 Receive +	DP-I	---	---
B65	PCIE_RX1-	PCI Express Lane 1 Receive -	DP-I	---	---
B66	WAKE0#	PCI Express Wake Event	I-3.3	PU 10k 3.3V (S5)	---
B67	WAKE1#	General Purpose Wake Event	I-3.3	PU 10k 3.3V (S5)	---
B68	PCIE_RX0+	PCI Express Lane 0 Receive +	DP-I	---	---
B69	PCIE_RX0-	PCI Express Lane 0 Receive -	DP-I	---	---
B70	GND	Power Ground	PWR GND	---	---
B71	LVDS_B0+	LVDS Channel B DAT0+	DP-0	---	---
B72	LVDS_B0-	LVDS Channel B DAT0-	DP-0	---	---
B73	LVDS_B1+	LVDS Channel B DAT1+	DP-0	---	---
B74	LVDS_B1-	LVDS Channel B DAT1-	DP-0	---	---
B75	LVDS_B2+	LVDS Channel B DAT2+	DP-0	---	---
B76	LVDS_B2-	LVDS Channel B DAT2-	DP-0	---	---
B77	LVDS_B3+	LVDS Channel B DAT3+	DP-0	---	---
B78	LVDS_B3-	LVDS Channel B DAT3-	DP-0	---	---
B79	LVDS_BKLT_EN	LVDS / EDP Panel Backlight On	O-3.3	PD 100k	---
B80	GND	Power Ground	PWR GND	---	---
B81	LVDS_B_CLK+	LVDS Channel B Clock+	DP-0	---	20-80MHz
B82	LVDS_B_CLK-	LVDS Channel B Clock-	DP-0	---	20-80MHz
B83	LVDS_BKLT_CTRL	LVDS / EDP Backlight Brightness Control	O-3.3	---	---
B84	VCC_5V_SBY	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)
B85	VCC_5V_SBY	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)
B86	VCC_5V_SBY	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)

Pin	Signal	Description	Type	Termination	Comment
B87	VCC_5V_SBY	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)
B88	BIOS_DIS1#	BIOS Selection Strap 1	I-3.3	PU 10k 3.3V (S5)	
B89	VGA_RED	CRT_RED / Analog Video RGB- RED	OA	PD 150R	Only on VGA Option
B90	GND	Power Ground	PWR GND	---	---
B91	VGA_GREEN	Analog Video RGB-GREEN	OA	PD 150R	Only on VGA Option
B92	VGA_BLUE	Analog Video RGB-BLUE	OA	PD 150R	Only on VGA Option
B93	VGA_HSYNC	Analog Video H-Sync	O-3.3	---	Only on VGA Option
B94	VGA_VSYNC	Analog Video V-Sync	O-3.3	---	Only on VGA Option
B95	VGA_I2C_CLK	Display Data Channel Clock	I/O-5	PU 2k4 3.3 (S0)	Only on VGA Option
B96	VGA_I2C_DATA	Display Data Channel Data	I/O-5	PU 2k4 3.3 (S0)	Only on VGA Option
B97	SPI_CS#	SPI Chip Select	O-3.3	---	---
B98	RSVD	Reserved for future use	nc	---	---
B99	RSVD	Reserved for future use	nc	---	---
B100	GND	Power Ground	PWR GND	---	---
B101	FAN_PWMOUT	Fan PWM Output	O-3.3	---	20V protection circuit implemented on module, PD on carrier board needed for proper operation
B102	FAN_TACHIN	Fan Tach Input	I-3.3	PU 47k 3.3V (S0)	20V protection circuit implemented on module
B103	SLEEP#	Sleep Button Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
B104	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B105	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B106	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B107	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---

Pin	Signal	Description	Type	Termination	Comment
B108	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B109	VCC_12V	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B110	GND	Power Ground	PWR GND	---	---

+ and - Differential pair differentiator

8.2.3. Connector X1B Row C 1 - C 110

Table 66: Connector X1B Row C Pin Assignment (C1-C110)

Pin	Signal	Description	Type	Termination	Comment
C1	GND	Power Ground	PWR GND	---	---
C2	GND	Power Ground	PWR GND	---	---
C3	USB_SSRX0-	USB Super Speed Receive 0 -	DP-I	---	---
C4	USB_SSRX0+	USB Super Speed Receive 0 +	DP-I	---	---
C5	GND	Power Ground	PWR GND	---	---
C6	USB_SSRX1-	USB Super Speed Receive 1 -	DP-I	---	---
C7	USB_SSRX1+	USB Super Speed Receive 1 +	DP-I	---	---
C8	GND	Power Ground	PWR GND	---	---
C9	USB_SSRX2-	USB Super Speed Receive 2 -	DP-I	---	Only on DDI3x2_USBSS_Port2 Option
C10	USB_SSRX2+	USB Super Speed Receive 2 +	DP-I	---	Only on DDI3x2_USBSS_Port2 Option
C11	GND	Power Ground	PWR GND	---	---
C12	USB_SSRX3-	USB Super Speed Receive 3 -	DP-I	---	---
C13	USB_SSRX3+	USB Super Speed Receive 3 +	DP-I	---	---
C14	GND	Power Ground	PWR GND	---	---
C15	DDI1_PAIR6+	Not Connected	nc	---	---
C16	DDI1_PAIR6-	Not Connected	nc	---	---
C17	RSVD	Reserved for future use	nc	---	---
C18	RSVD	Reserved for future use	nc	---	---
C19	PCIE_RX6+	PCI Express Lane 6 Receive +	DP-I	---	---
C20	PCIE_RX6-	PCI Express Lane 6 Receive -	DP-I	---	---
C21	GND	Power Ground	PWR GND	---	---
C22	PCIE_RX7+	PCI Express Lane 7 Receive +	DP-I	---	---
C23	PCIE_RX7-	PCI Express Lane 7 Receive -	DP-I	---	---
C24	DDI1_HPDP	DDI1 Hotplug Detect	I-3.3	PD 100k	
C25	DDI1_PAIR4+	Not Connected	nc	---	---
C26	DDI1_PAIR4-	Not Connected	nc	---	---
C27	RSVD	Reserved for future use	nc	---	---
C28	RSVD	Reserved for future use	nc	---	---

Pin	Signal	Description	Type	Termination	Comment
C29	DDI1_PAIR5+	Not Connected	nc	---	---
C30	DDI1_PAIR5-	Not Connected	nc	---	---
C31	GND	Power Ground	PWR GND	---	---
C32	DDI2_CTRLCLK_A UX+	DDI2 CTRLCLK/AUX+	I/O-3.3	PD 100k	---
C33	DDI2_CTRLDATA_ AUX-	DDI2 CTRLDATA/AUX-	I/O-3.3	PU 100k 3.3V (S0)	---
C34	DDI2_DDC_AUX_S EL	DDI2 DDC/AUX select	I-3.3	PD 1M	---
C35	RSVD	Reserved for future use	nc	---	---
C36	DDI3_CTRLCLK_A UX+	DDI3 CTRLCLK/AUX+	I/O-3.3	PD 100k	---
C37	DDI3_CTRLDATA_ AUX-	DDI3 CTRLDATA/AUX-	I/O-3.3	PU 100k 3.3V (S0)	---
C38	DDI3_DDC_AUX_S EL	DDI3 DDC/AUX select	I-3.3	PD 1M	---
C39	DDI3_PAIR0+	DDI3 Pair 0 +	DP-0	---	---
C40	DDI3_PAIR0-	DDI3 Pair 0 -	DP-0	---	---
C41	GND	Power Ground	PWR GND	---	---
C42	DDI3_PAIR1+	DDI3 Pair 1 +	DP-0	---	---
C43	DDI3_PAIR1-	DDI3 Pair 1 -	DP-0	---	---
C44	DDI3_HPD	DDI3 Hotplug Detect	I-3.3	PD 100k	---
C45	RSVD	Reserved for future use	nc	---	---
C46	DDI3_PAIR2+	DDI3 Pair 2 +	DP-0	---	---
C47	DDI3_PAIR2-	DDI3 Pair 2 -	DP-0	---	---
C48	RSVD	Reserved for future use	nc	---	---
C49	DDI3_PAIR3+	DDI3 Pair 3 +	DP-0	---	---
C50	DDI3_PAIR3-	DDI3 Pair 3 -	DP-0	---	---
C51	GND	Power Ground	PWR GND	---	---
C52	PEG_RX0+	PEG Lane 0 Receive +	DP-I	---	---
C53	PEG_RX0-	PEG Lane 0 Receive -	DP-I	---	---
C54	TYPE0#	nc for type 6 module	nc	---	---
C55	PEG_RX1+	PEG Lane 1 Receive +	DP-I	---	---
C56	PEG_RX1-	PEG Lane 1 Receive -	DP-I	---	---
C57	TYPE1#	nc for type 6 module	nc	---	---
C58	PEG_RX2+	PEG Lane 2 Receive +	DP-I	---	---
C59	PEG_RX2-	PEG Lane 2 Receive -	DP-I	---	---
C60	GND	Power Ground	PWR GND	---	---
C61	PEG_RX3+	PEG Lane 3 Receive +	DP-I	---	---
C62	PEG_RX3-	PEG Lane 3 Receive -	DP-I	---	---
C63	RSVD	Reserved for future use	nc	---	---
C64	RSVD	Reserved for future use	nc	---	---
C65	PEG_RX4+	PEG Lane 4 Receive +	DP-I	---	---
C66	PEG_RX4-	PEG Lane 4 Receive -	DP-I	---	---

Pin	Signal	Description	Type	Termination	Comment
C67	RAPID_SHUTDOWN	Not Connected	nc	---	--
C68	PEG_RX5+	PEG Lane 5 Receive +	DP-I	---	---
C69	PEG_RX5-	PEG Lane 5 Receive -	DP-I	---	---
C70	GND	Power Ground	PWR GND	---	---
C71	PEG_RX6+	PEG Lane 6 Receive +	DP-I	---	---
C72	PEG_RX6-	PEG Lane 6 Receive -	DP-I	---	---
C73	GND	Power Ground	PWR GND	---	---
C74	PEG_RX7+	PEG Lane 7 Receive +	DP-I	---	---
C75	PEG_RX7-	PEG Lane 7 Receive -	DP-I	---	---
C76	GND	Power Ground	PWR GND	---	---
C77	RSVD	Reserved for future use	nc	---	---
C78	PEG_RX8+	Not Connected	nc	---	---
C79	PEG_RX8-	Not Connected	nc	---	---
C80	GND	Power Ground	PWR GND	---	---
C81	PEG_RX9+	Not Connected	nc	---	---
C82	PEG_RX9-	Not Connected	nc	---	---
C83	RSVD	Reserved for future use	nc	---	---
C84	GND	Power Ground	PWR GND	---	---
C85	PEG_RX10+	Not Connected	nc	---	---
C86	PEG_RX10-	Not Connected	nc	---	---
C87	GND	Power Ground	PWR GND	---	---
C88	PEG_RX11+	Not Connected	nc	---	---
C89	PEG_RX11-	Not Connected	nc	---	---
C90	GND	Power Ground	PWR GND	---	---
C91	PEG_RX12+	Not Connected	nc	---	---
C92	PEG_RX12-	Not Connected	nc	---	---
C93	GND	Power Ground	PWR GND	---	---
C94	PEG_RX13+	Not Connected	nc	---	---
C95	PEG_RX13-	Not Connected	nc	---	---
C96	GND	Power Ground	PWR GND	---	---
C97	RSVD	Reserved for future use	nc	---	---
C98	PEG_RX14+	Not Connected	nc	---	---
C99	PEG_RX14-	Not Connected	nc	---	---
C100	GND	Power Ground	PWR GND	---	---
C101	PEG_RX15+	Not Connected	nc	---	---
C102	PEG_RX15-	Not Connected	nc	---	---
C103	GND	Power Ground	PWR GND	---	---
C104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---

Pin	Signal	Description	Type	Termination	Comment
C106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C110	GND	Power Ground	PWR GND	---	---

+ and - Differential pair differentiator

8.2.4. Connector X1B Row D 1 - D 110

Table 67: Connector X1B Row C Pin Assignment (D1-D110)

Pin	Signal	Description	Type	Termination	Comment
D1	GND	Power Ground	PWR GND	---	---
D2	GND	Power Ground	PWR GND	---	---
D3	USB_SSTX0-	USB Super Speed Transmit 0 -	DP-0	---	---
D4	USB_SSTX0+	USB Super Speed Transmit 0 +	DP-0	---	---
D5	GND	Power Ground	PWR GND	---	---
D6	USB_SSTX1-	USB Super Speed Transmit 1 -	DP-0	---	---
D7	USB_SSTX1+	USB Super Speed Transmit 1 +	DP-0	---	---
D8	GND	Power Ground	PWR GND	---	---
D9	USB_SSTX2-	USB Super Speed Transmit 2 -	DP-0	---	Only on DDI3x2_USBSS_Port2 Option
D10	USB_SSTX2+	USB Super Speed Transmit 2 +	DP-0	---	Only on DDI3x2_USBSS_Port2 Option
D11	GND	Power Ground	PWR GND	---	---
D12	USB_SSTX3-	USB Super Speed Transmit 3 -	DP-0	---	---
D13	USB_SSTX3+	USB Super Speed Transmit 3 +	DP-0	---	---
D14	GND	Power Ground	PWR GND	---	---
D15	DDI1_CTRLCLK_AUX+	DDI1 CTRLCLK/AUX+	I/O-3.3	PD 100k	---
D16	DDI1_CTRLDATA_AUX-	DDI1 CTRLDATA/AUX-	I/O-3.3	PU 100k 3.3V (S0)	---
D17	RSVD	Reserved for future use	nc	---	---
D18	RSVD	Reserved for future use	nc	---	---
D19	PCIE_TX6+	PCI Express Lane 6 Transmit +	DP-0	---	---
D20	PCIE_TX6-	PCI Express Lane 6 Transmit -	DP-0	---	---
D21	GND	Power Ground	PWR GND	---	---
D22	PCIE_TX7+	PCI Express Lane 7 Transmit +	DP-0	---	---
D23	PCIE_TX7-	PCI Express Lane 7 Transmit -	DP-0	---	---

Pin	Signal	Description	Type	Termination	Comment
D24	RSVD	Reserved for future use	nc	---	---
D25	RSVD	Reserved for future use	nc	---	---
D26	DDI1_PAIR0+	DDI1 Pair 0 +	DP-0	---	---
D27	DDI1_PAIR0-	DDI1 Pair 0 -	DP-0	---	---
D28	RSVD	Reserved for future use	nc	---	---
D29	DDI1_PAIR1+	DDI1 Pair 1 +	DP-0	---	---
D30	DDI1_PAIR1-	DDI1 Pair 1 -	DP-0	---	---
D31	GND	Power Ground	PWR GND	---	---
D32	DDI1_PAIR2+	DDI1 Pair 2 +	DP-0	---	---
D33	DDI1_PAIR2-	DDI1 Pair 2 -	DP-0	---	---
D34	DDI1_DDC_AUX_SEL	DDI1 DDC/AUX select	I-3.3	PD 1M	---
D35	RSVD	Reserved for future use	nc	---	---
D36	DDI1_PAIR3+	DDI1 Pair 3 +	DP-0	---	---
D37	DDI1_PAIR3-	DDI1 Pair 3 -	DP-0	---	---
D38	RSVD	Reserved for future use	nc	---	---
D39	DDI2_PAIR0+	DDI2 Pair 0 +	DP-0	---	---
D40	DDI2_PAIR0-	DDI2 Pair 0 -	DP-0	---	---
D41	GND	Power Ground	PWR GND	---	---
D42	DDI2_PAIR1+	DDI2 Pair 1 +	DP-0	---	---
D43	DDI2_PAIR1-	DDI2 Pair 1 -	DP-0	---	---
D44	DDI2_HPDP	DDI2 Hotplug Detect	I-3.3	PD 100k	---
D45	RSVD	Reserved for future use	nc	---	---
D46	DDI2_PAIR2+	DDI2 Pair 2 +	DP-0	---	---
D47	DDI2_PAIR2-	DDI2 Pair 2 -	DP-0	---	---
D48	RSVD	Reserved for future use	nc	---	---
D49	DDI2_PAIR3+	DDI2 Pair 3 +	DP-0	---	---
D50	DDI2_PAIR3-	DDI2 Pair 3 -	DP-0	---	---
D51	GND	Power Ground	PWR GND	---	---
D52	PEG_TX0+	PEG Lane 0 Transmit +	DP-0	---	---
D53	PEG_TX0-	PEG Lane 0 Transmit -	DP-0	---	---
D54	PEG_LANE_RV#	Not Connected	nc	---	---
D55	PEG_TX1+	PEG Lane 1 Transmit +	DP-0	---	---
D56	PEG_TX1-	PEG Lane 1 Transmit -	DP-0	---	---
D57	TYPE2#	GND for type 6 module	PWR	---	---
D58	PEG_TX2+	PEG Lane 2 Transmit +	DP-0	---	---
D59	PEG_TX2-	PEG Lane 2 Transmit -	DP-0	---	---
D60	GND	Power Ground	PWR GND	---	---
D61	PEG_TX3+	PEG Lane 3 Transmit +	DP-0	---	---
D62	PEG_TX3-	PEG Lane 3 Transmit -	DP-0	---	---
D63	RSVD	Reserved for future use	nc	---	---
D64	RSVD	Reserved for future use	nc	---	---
D65	PEG_TX4+	PEG Lane 4 Transmit +	DP-0	---	---

Pin	Signal	Description	Type	Termination	Comment
D66	PEG_TX4-	PEG Lane 4 Transmit -	DP-0	---	---
D67	GND	Power Ground	PWR GND	---	---
D68	PEG_TX5+	PEG Lane 5 Transmit +	DP-0	---	---
D69	PEG_TX5-	PEG Express Lane 5 Transmit -	DP-0	---	---
D70	GND	Power Ground	PWR GND	---	---
D71	PEG_TX6+	PEG Lane 6 Transmit +	DP-0	---	---
D72	PEG_TX6-	PEG Lane 6 Transmit -	DP-0	---	---
D73	GND	Power Ground	PWR GND	---	---
D74	PEG_TX7+	PEG Lane 7 Transmit +	DP-0	---	---
D75	PEG_TX7-	PEG Lane 7 Transmit -	DP-0	---	---
D76	GND	Power Ground	PWR GND	---	---
D77	RSVD	Reserved for future use	nc	---	---
D78	PEG_TX8+	Not Connected	nc	---	---
D79	PEG_TX8-	Not Connected	nc	---	---
D80	GND	Power Ground	PWR GND	---	---
D81	PEG_TX9+	Not Connected	nc	---	---
D82	PEG_TX9-	Not Connected	nc	---	---
D83	RSVD	Reserved for future use	nc	---	---
D84	GND	Power Ground	PWR GND	---	---
D85	PEG_TX10+	Not Connected	nc	---	---
D86	PEG_TX10-	Not Connected	nc	---	---
D87	GND	Power Ground	PWR GND	---	---
D88	PEG_TX11+	Not Connected	nc	---	---
D89	PEG_TX11-	Not Connected	nc	---	---
D90	GND	Power Ground	PWR GND	---	---
D91	PEG_TX12+	Not Connected	nc	---	---
D92	PEG_TX12-	Not Connected	nc	---	---
D93	GND	Power Ground	PWR GND	---	---
D94	PEG_TX13+	Not Connected	nc	---	---
D95	PEG_TX13-	Not Connected	nc	---	---
D96	GND	Power Ground	PWR GND	---	---
D97	RSVD	Reserved for future use	nc	---	---
D98	PEG_TX14+	Not Connected	nc	---	---
D99	PEG_TX14-	Not Connected	nc	---	---
D100	GND	Power Ground	PWR GND	---	---
D101	PEG_TX15+	Not Connected	nc	---	---
D102	PEG_TX15-	Not Connected	nc	---	---
D103	GND	Power Ground	PWR GND	---	---
D104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---

Pin	Signal	Description	Type	Termination	Comment
D106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D110	GND	Power Ground	PWR GND	---	---

+ and - Differential pair differentiator

9/ UEFI BIOS

9.1. Starting the UEFI BIOS

The COMe-cVR6 uses a Kontron-customized, pre-installed and configured version of Aptio® V UEFI BIOS based on the Unified Extensible Firmware Interface (UEFI) specification.



The BIOS version covered in this document might not be the latest version. The latest version might have certain differences to the BIOS options and features described in this chapter.



Register for the EMD Customer Section to get access to BIOS downloads and PCN service.

The UEFI BIOS comes with a Setup program that provides quick and easy access to the individual function settings for control or modification of the UEFI BIOS configuration. The Setup program allows for access to various menus that provide functions or access to sub-menus with further specific functions of their own.

To start the UEFI BIOS Setup program, follow the steps below:

1. Power on the board.
2. Wait until the first characters appear on the screen (POST messages or splash screen).
3. Press the key.
4. If the UEFI BIOS is password-protected, a request for password will appear. Enter either the User Password or Supervisor Password (see Chapter 9.2.4 Security Setup Menu), press <RETURN>, and proceed with step 5.
5. A Setup menu appears.

The COMe-cVR6 UEFI BIOS Setup program uses a hot key navigation system. The hot key legend bar is located at the bottom of the Setup screens. The following table provides a list of navigation hot keys available in the legend bar.

Table 68: Navigation Hot Keys Available in the Legend Bar

Sub-screen	Description
<F1>	<F1> key invokes the General Help window
<->	<Minus> key selects the next lower value within a field
<+>	<Plus> key selects the next higher value within a field
<F2>	<F2> key loads previous values
<F3>	<F3> key loads optimized defaults
<F4>	<F4> key Saves and Exits
<←> or <→>	<Left/Right> arrows selects major Setup menus on menu bar, for example, Main or Advanced
<↑> or <↓>	<Up/Down> arrows select fields in the current menu, for example, Setup function or sub-screen
<ESC>	<ESC> key exits a major Setup menu and enters the Exit Setup menu Pressing the <ESC> key in a sub-menu displays the next higher menu level
<RETURN>	<RETURN> key executes a command or selects a submenu

9.2. Setup Menus

The Setup utility features menus listed in the selection bar at the top of the screen are:

- ▶ Main
- ▶ Advanced
- ▶ Chipset
- ▶ Security
- ▶ Boot
- ▶ Save & Exit

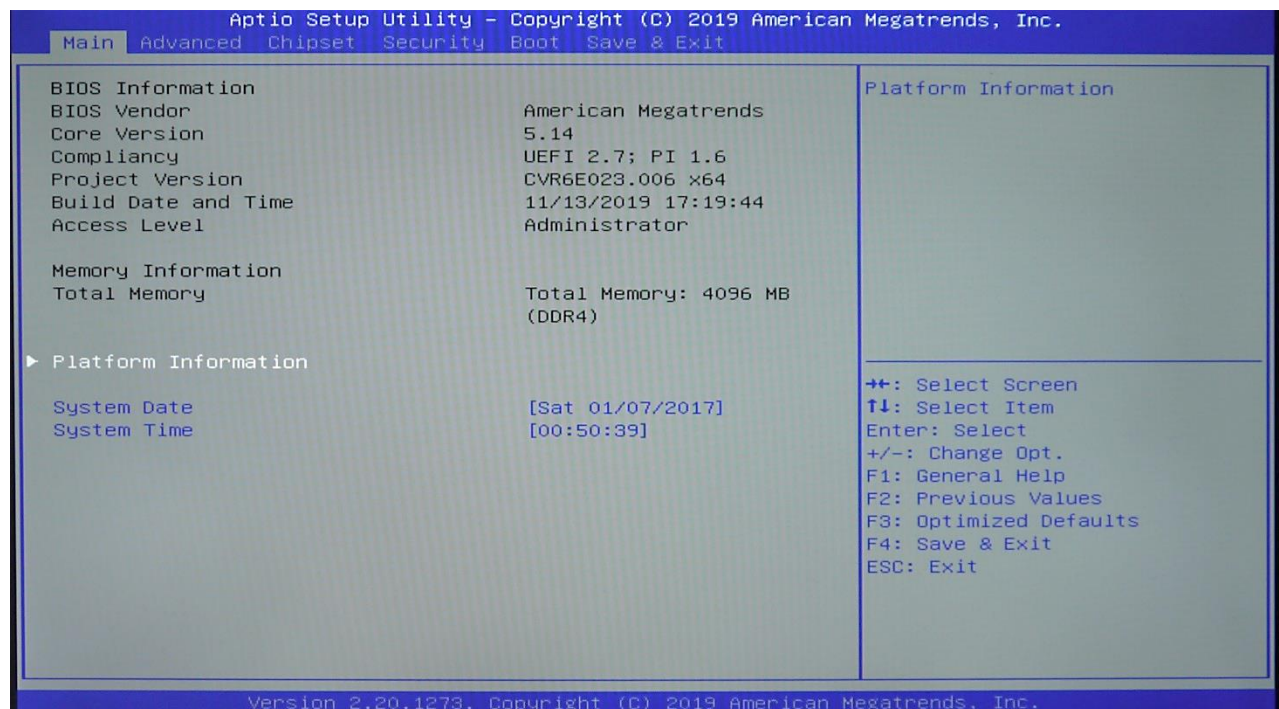
The currently active menu and the currently active UEFI BIOS Setup item are highlighted in white. Use the left and right arrow keys to navigate to the required Setup menu and select the Setup menu by pressing <RETURN>.

Each Setup menu provides two main frames. The left frame displays all available functions. Configurable functions are displayed in blue. Functions displayed in grey provide information about the status or the operational configuration. The right frame displays a Help window providing an explanation of the respective function.

9.2.1. Main Setup Menu

On entering the UEFI BIOS the Setup program displays the Main Setup menu. This screen lists the Main Setup menu sub-screens and provides basic system information as well as functions for setting the system language, time and date.

Figure 10: Main Setup Menu Information Initial Screens



The following table shows the Main Menu sub-screens and functions and describes the content. Default options are displayed **bold**. Some functions include additional information.

Table 69: Main Setup Menu Sub-screens

Sub-Screen	Description
BIOS Information>	Read only field <i>Displays BIOS Information:</i> BIOS vendor, Core version, Compliancy, Kontron BIOS Version and Access Level
Board Information>	Read only field <i>Displays Board Information:</i> Board ID, Fab ID, and LAN PHY revision
Platform Information>	Read only field <i>Displays Module Information</i> Product Name, Revision, Serial # ,MAC Address, Boot Counter, and CPLD Rev
	<p>Additional information for MAC Address</p> <p>The MAC address entry is the value used by the Ethernet controller and may contain the entry 'Inactive' - Ethernet chip is inactive. Activate the Ethernet chip by setting the following to 'enable'. Advanced > Network Stack Configuration > Network Stack > Enable</p> <p>88:88:88:88:87:88 is a special pattern that will be filled in by the Ethernet firmware if there is no valid entry in the firmware block of the BIOS SPI (i.e. the MAC address has been overwritten during the last attempt to flash the system).</p>
System Date>	Displays the system date [Day mm/dd/yyyy]
System Time>	Displays the system time [hh:mm:ss]

9.2.2. Advanced Setup Menu

The Advanced Setup menu provides sub-screens and second level sub-screens with functions for advanced configuration.

NOTICE Setting items, on this screen, to incorrect values may cause system malfunctions.

Figure 11: Advanced Setup Menu Initial Screen

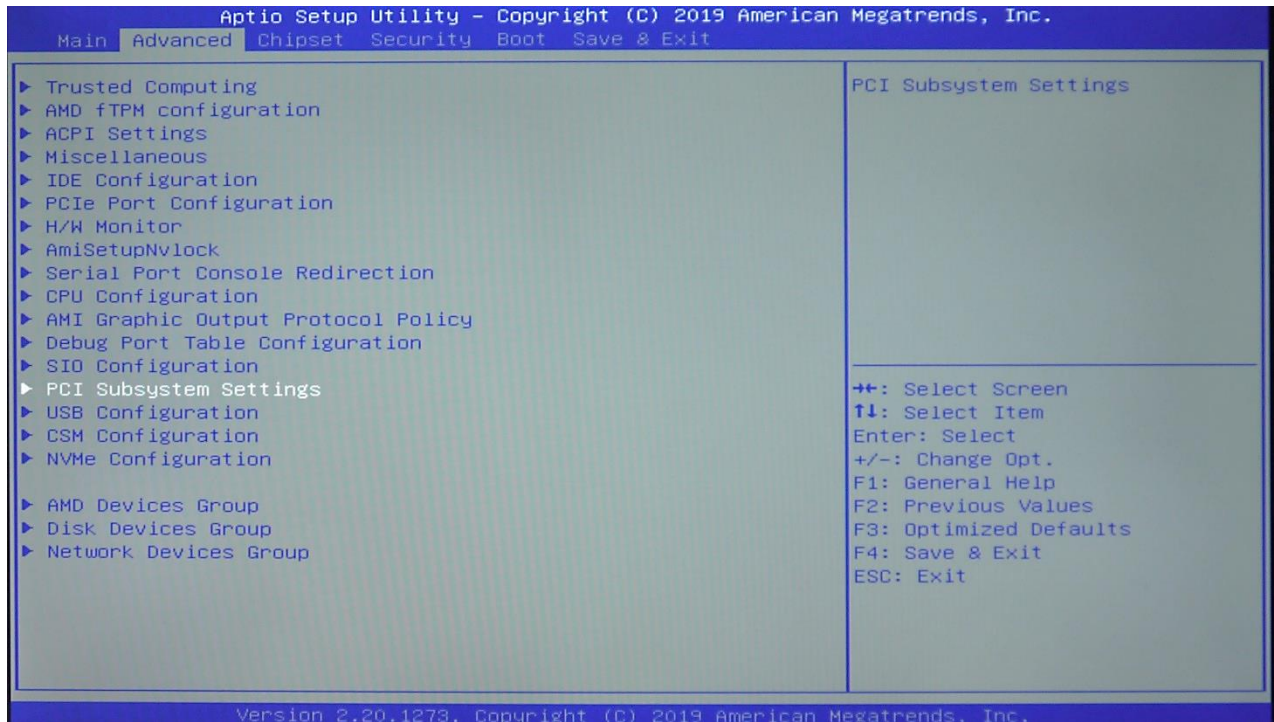


Table 70: Advanced Setup menu Sub-screens and Functions

Sub-Screen	Function	Second level Sub-Screen / Description
Trusted Computing	Security Device Support	[Enabled, Disabled]
	Pending Operation	[None, TPM cleared]
	Platform Hierarchy	[Enabled, Disabled]
	Storage Hierarchy	[Enabled, Disabled]
	Endorsement Hierarchy	[Enabled, Disabled]
	TPM2.0 UEFI Spec Version	[TCG_1_2, TCG_2]
	Physical Presence Spec Version	[1.2, 1.3]
AMD fTPM Configuration	AMD fTPM switch	[Rout to LPC TPM, AMD CPU fTPM]
	Erase fTPM NV for factory reset	[Enabled, Disabled]

Sub-Screen	Function	Second level Sub-Screen / Description	
ACPI Settings	Enable ACPI Auto Configuration	[Enabled, Disabled]	
	Enable Hibernation	[Enabled , Disabled]	
	ACPI Sleep State	[S3 (Suspend to RAM) , Suspend Disabled]	
Miscellaneous	Generic LPC Decode 1	[Enabled, Disabled]	
	Smart Battery Configuration	MARS	[Auto , Disabled, Charger, Manager]
		Battery #1 to #4	
	Watchdog	Auto-reload	[Enabled, Disabled]
		Global Lock	[Enabled, Disabled]
		Stage 1 Mode	[Enabled, Disabled]
	I2C Speed	200	
	Onboard I2C Mode	[Busclear, Multimaster]	
	Sleep Button Mode	[Enabled, Disabled]	
	Lid Switch Mode	[Enabled, Disabled]	
	SMBus device ACPI mode	[Hidden, Normal]	
	CPLD device ACPI mode	[Hidden, Normal]	
	Control COMe GPIOs in BIOS	[Enabled, Disabled]	
	GPIO IRQ #	[IRQ 3-15, Disabled]	
I2C IRQ #	[IRQ 3-15, Disabled]		
IDE Configuration	SATA Port0-5	Not Present	
PCIe Port Configuration	PCIe Port Control	[Enabled , Disabled]	
	Device 1 Fun 1	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
	Device 1 Fun 3	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
	Device 1 Fun 4	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
	Device 1 Fun 5	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
	Device 1 Fun 6	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
	Device 1 Fun 7	[Auto , Enabled, Disabled]	ASPM Mode [Enabled, Disabled]
H/W Monitor	Fan Control	[Auto , Manual, Disabled]	
	Fan Pulse	2	
	Fan Trip Point	50	
	Trip Point Speed	50	
	Reference Temperature	[CPU Temperature , Module Temp.]	
AmiSetupNvLock	RunTimeVariable Protection Support	[Enabled , Disabled]	

Sub-Screen	Function	Second level Sub-Screen / Description	
Serial PortConsole Redirection	COM0/1/2/3 Console Redirection	[Enabled, Disabled]	
	Legacy Console Redirection Settings	Redirection COM Port	[COM1/2/3, COM0]
		Resolution	[80x24 , 80x25]
		Redirect after POST	[Always Enabled , BootLoader]
Out-of-Band Management/EMS Console Redirection	[Enabled, Disabled]		
CPU Configuration	PSS Support	[Enabled , Disabled]	
	PPC Adjustment	[Pstate0 , Pstate1/2]	
	NX Mode	[Enabled , Disabled]	
	SVM Mode	[Enabled , Disabled]	
	Node 0 Information		
AMI Graphic Output Protocol Policy	Output Select	[DFP1_DP]	
Debug Port Table Configuration	Debug Port Table	[Enabled, Disabled]	
	Debug Port Table 2	[Enabled, Disabled]	
SIO Configuration	[*Active*] Serial Port 1 or 2	Use This Device	[Enabled , Disabled]
		Possible:	[Use Automatic Settings , IO =; IRQ=]
PCI Subsystems Settings	Above 4G Decodeing	[Enabled, Disabled]	
	SR-IOV Support	[Enabled, Disabled]	
	BME DMA Support	[Enabled, Disabled]	
USB Configuration	Legacy USB Support	[Enabled , Disabled]	
	XHCI Legacy Support	[Enabled , Disabled]	
	XHCI Hand-Off	[Enabled , Disabled]	
	USB Mass Storage Driver Support	[Enabled , Disabled]	
	Port 60/64 Emulation	[Enabled , Disabled]	
	USB transfer time-out	[20 sec , 1/5/10 sec]	
	Device reset time-out	[20 sec , 10/30/40 sec]	
	Device Power-up Delay	[Auto , manual]	

Sub-Screen	Function	Second level Sub-Screen / Description		
CSM Configuration	CSM Support	[Enabled, Disabled]		
NVMe Configuration				
AMD Devices Group AMD CBS	Zen Common Options	Core Performance Boost	[Auto , Disabled]	
		Global C-State Control	[Auto , Disabled]	
		OC Mode	[Normal Operation , OC1, Customized]	
		Custom Pstates/Throttling		
		Core/Thread Enablement	[Agree, Disagree]	
	NBIO Common Options	GFX Configuration	Integrated Graphics Controller	[Auto , Forces, Disabled]
			NB Azalia	[Auto , Enabled, Disabled]
			NB Configuration	IOMMU [Auto , Enabled, Disabled]
			PCIe Configuration	PSPP Policy [Auto , Disabled, Performance, Balanced, Power Saving]
			System Configuration	[Auto , 12 W, 15 W...54 W]
			Audio IOs	[Auto, Max HDA, Max mHDA, Max Soundwire/MinHDA, Max Soundwire/Min mHDA, I2S, Disable Audio IOs, Soundwire]
			FCH Common Options	SATA Configuration Options
	SATA RAS Support	[Auto , Disabled, Enabled]		
	SATA Disabled AHCI Prefetch Function	[Auto , Disabled, Enabled]		
	Aggressive SATA Device Sleep Port 0	[Auto , Disabled, Enabled]		
	Aggressive SATA Device Sleep Port 1	[Auto , Disabled, Enabled]		
	USB Configuration options	XHCIO controller enable		[Auto , Disabled, Enabled]
		XHCI1 controller enable		[Auto , Disabled, Enabled]
	AC Power Loss Options			[Always Off, Always On , Reserved, Previous]
	System Control			Toggle All Pwr Good on Cf9 [Auto , Disabled, Enabled]
AMD PBS	AMD Firmware Version			
	KBC Support	[Enabled , Disabled]		
	VDDP Voltage	[VDDP Voltage 0.9 V , VDDP Voltage 0.8 V]		

Sub-Screen	Function	Second level Sub-Screen / Description	
	AMD KVM Mouse	[Auto , Absolute, Simple]	
	PCIe GFX Port Config	[1x8 , 2x4]	
	PCIe GPP Port Config	[1x2 4x1 , 2x1 1x4, ... 2x1 2x1 1x2]	
Disk Devices Group	Disk Memory Type	[Boot Service Data , Reserved]	
RAM Disk Configuration		Create raw	Size [1], Create/Discard&Exit
		Create from file	
		Remove selected RAM disks	
Network Devices Group	Network Stack Configuration	Network Stack	[Enabled, Disabled]

9.2.3. Chipset Menu

NOTICE Setting items, on this screen, to incorrect values may cause system malfunctions.

Figure 12: Chipset Menu Initial Screen

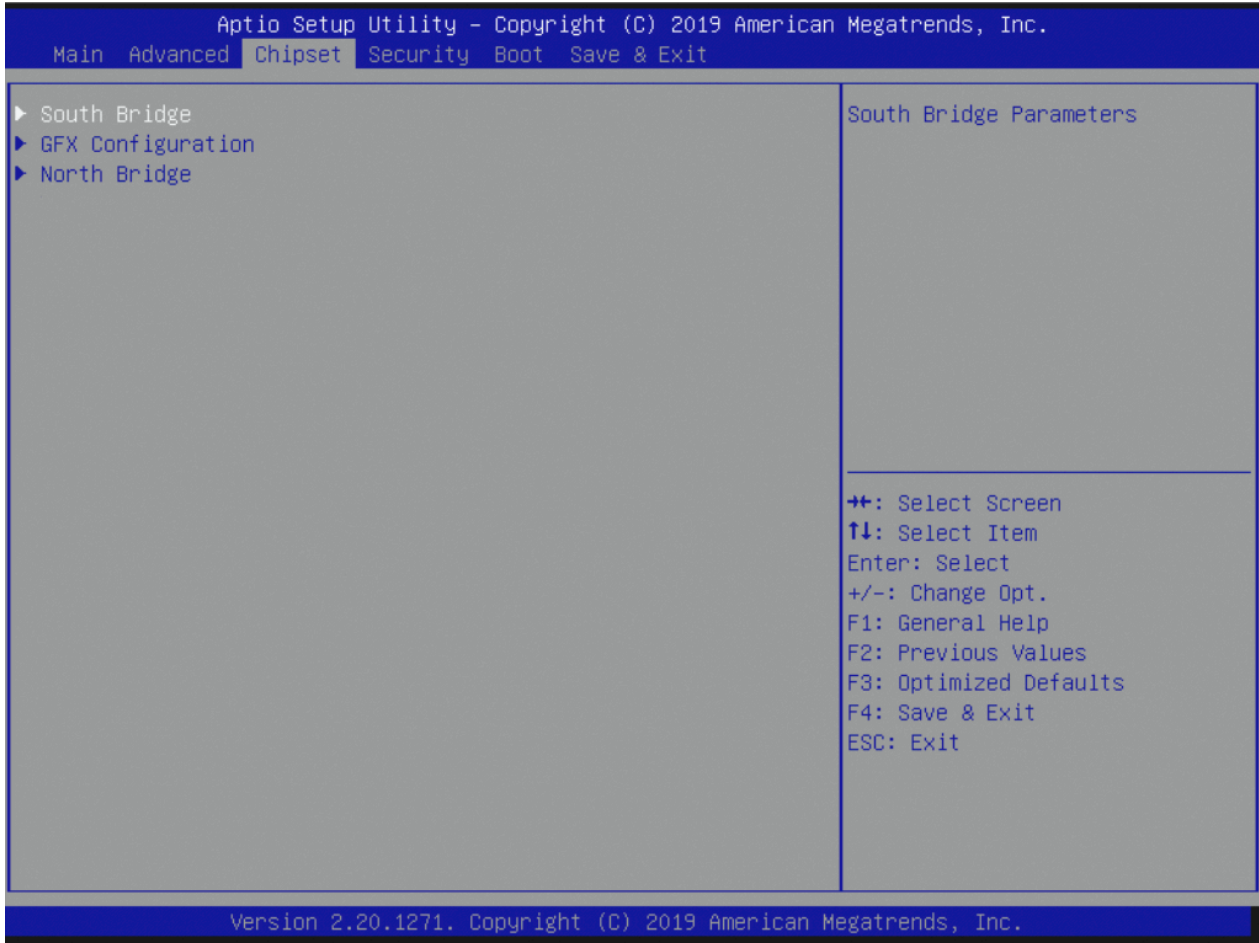


Table 71: Chipset menu Sub-screens and Functions

Sub-Screen	Function	Second level Sub-Screen / Description	
South Bridge	SB USB Configuration	XHCI0 Port 0/1/2/3	[Enabled, Disabled]
		XHCI1 Port 0/1	[Enabled, Disabled]
	SB Power Saving	AB Clock Gating	[Auto, Enabled, Disabled]
		PCIB Clock Run	[Auto, Enabled, Disabled]
GFX Configuration	Remote Display Feature	[Enabled, Disabled]	
	Gnb Hd Audio	[Enabled, Disabled]	
	IGD – AmdGop Output Priority	[Default, Manually]	
	eDP Port	[Enabled, Disabled]	
	Integrated eDP to LVDS Bridge	[Auto, Disabled]	

Sub-Screen	Function	Second level Sub-Screen / Description	
	LFP Resolution	[Auto , VGA, WGA, XGA, WXGA/+, WSVGA/+, SXGA, UXGA, WUXGA, FHD, Custom]	
	Panel Channel Mode	[Auto , Single, Dual]	
	Backlight Control	[PWM , None, PWM Inverted, I2C/Inverted]	
	PWM Frequency	[200 Hz , 400 Hz, 1 kHz..40 kHz]	
	Backlight Value	[128]	
	LVDS Clock Center Spreading	[No Spreading , 0.5%, 1.0%, 1.5%,2.0%, 2.5]	
North Bridge	Socket 0 Information		

9.2.4. Security Setup Menu

The Security Setup menu provides information about the passwords and functions for specifying the security settings. The passwords are case-sensitive.

Figure 13: Security Setup Menu Initial Screen

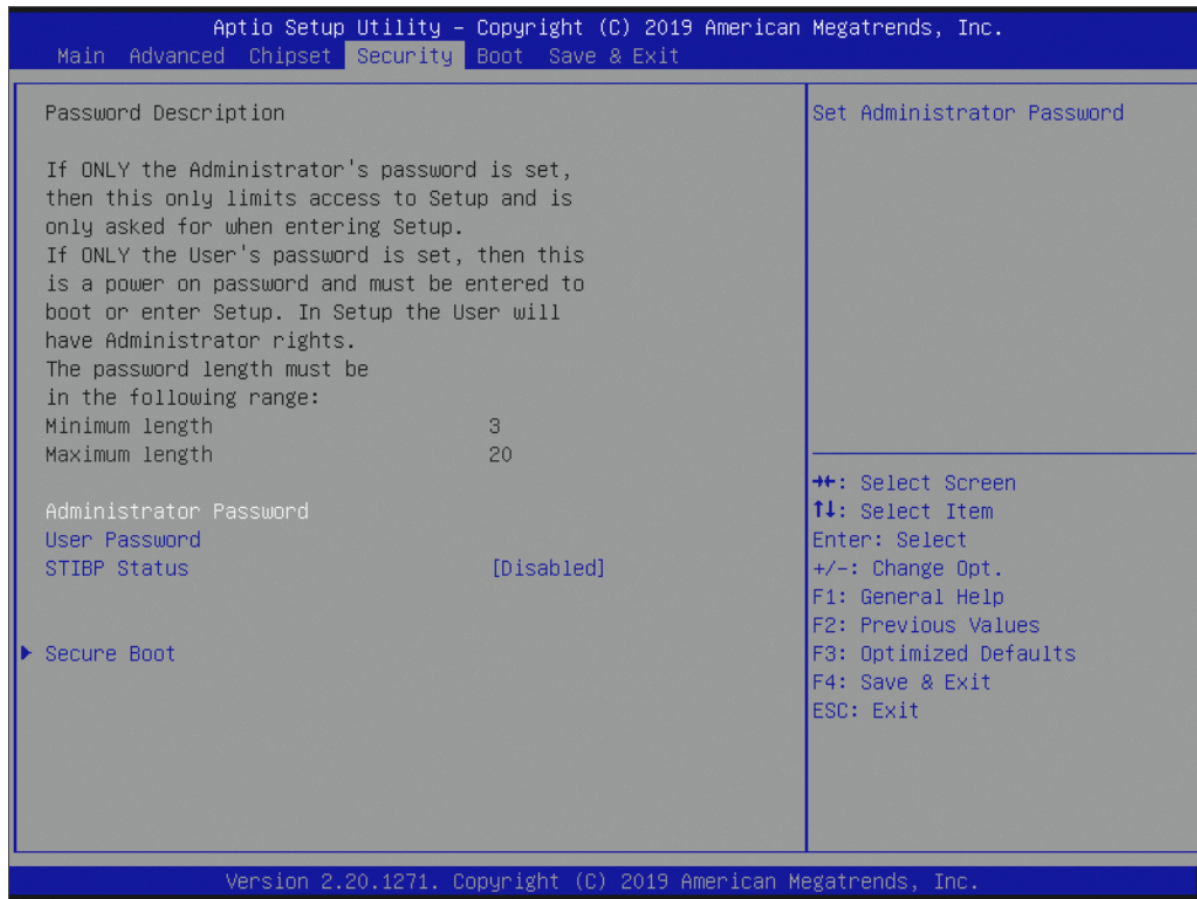


Table 72: Security Setup Menu Functions

Function	Description	
Administrator Password>	Sets administrator password	
User Password>	Sets user password	
STIBP Status	[Enabled, Disabled]	
Secure Boot	[Enabled, Disabled]	
	Secure Boot Customization	[Custom , Standard]
	Restore Factory Keys	
	Reset to Setup Mode	
	Key Management	
	Factory Key Provision	[Enabled, Disabled]
	Restore Factory Keys	

Function	Description	
	Enroll Efi Image	
	Restore DB Defaults	
	Platform Key	
	Key Exchange Keys	
	Authorized Signatures	
	Forbidden Signatures	
	Authorized TimeStamps	
	OSRecovery Signatures	



If only the administrator's password is set, then only access to setup is limited and requested when entering the setup.

If only the user's password is set, then the password is a power on password and must be entered to boot or enter setup. In the setup the user has administrator rights.

The required password length in characters is max. 20 and min. 3.

9.2.4.1. Remember the Password

It is highly recommended to keep a record of all passwords in a safe place. Forgotten passwords results in the user being locked out of the system.

If the system cannot be booted because the User Password or the Supervisor Password are not known, clear the UEFI BIOS settings, or contact Kontron Support for further assistance.

9.2.5. Boot Menu

The Boot menu provides functions for booting up the setup program.

Figure 14: Boot Screen

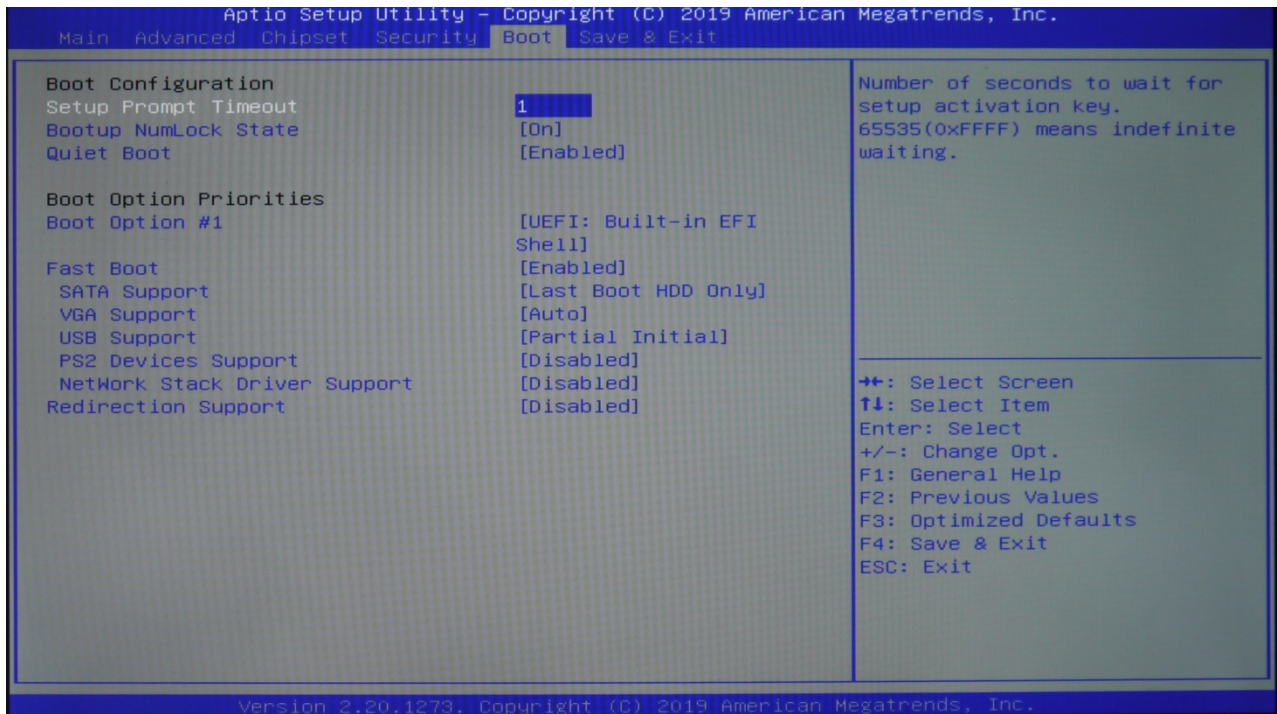


Table 73: Boot Menu Functions

Function	Description
Setup Prompt Timeout>	1
Bootup NumLock State>	[On, Off]
Quiet Boot>	[Enabled, Disabled]
Boot Option Priorities	
Boot Option #1	[UEFI: Built-in EFI Shell, Disabled]
Fast Boot	[Enabled, Disabled]
SATA Support	[Last Boot HDD Only, All SATA Devices]
VGA Support	[EFI Driver, Auto]
USB Support	[Full Initial, Disabled, Partial Initial]
PS2 Devices support	[Enabled, Disabled]
Network Stack Driver Support	[Enabled, Disabled]
Redirection Support	[Enabled, Disabled]

9.2.6. Save and Exit Setup Menu

The Save and Exit setup menu provides functions for handling changes made to the UEFI BIOS settings and exiting the setup program.

Figure 15: Save and Exit Setup Menu Initial Screen

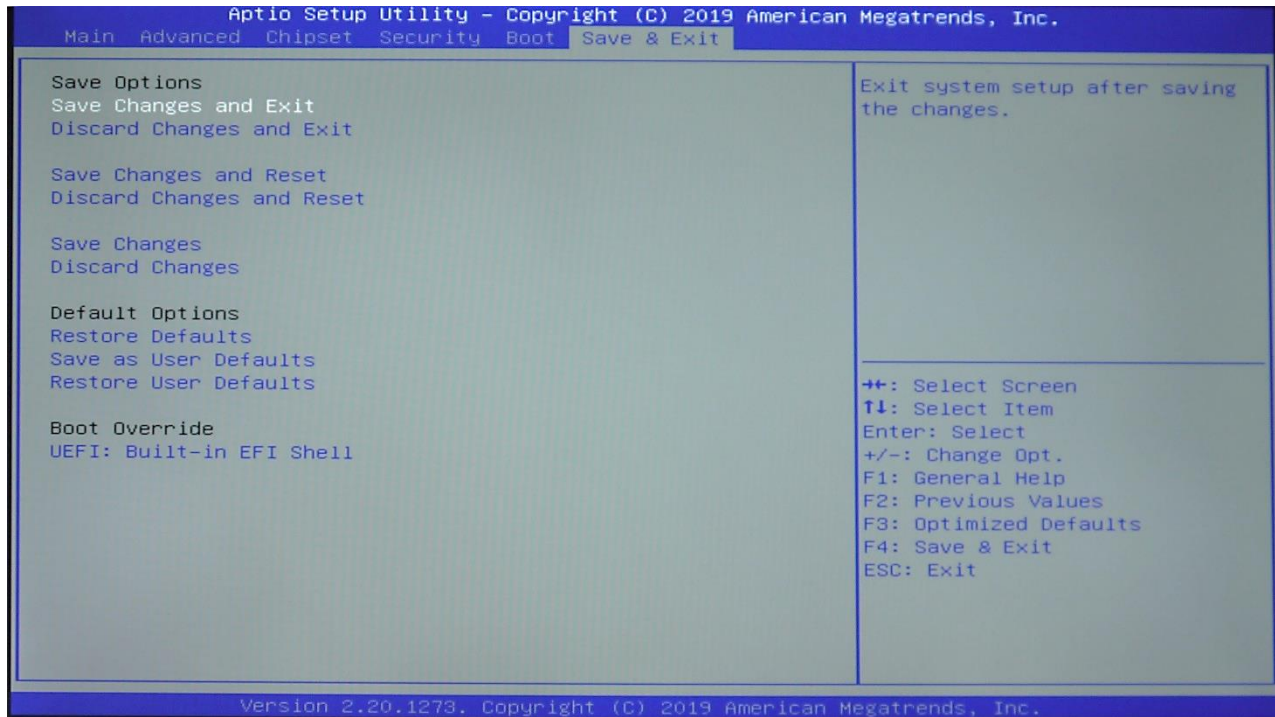


Table 74: Save and Exit Setup Menu Functions

Function	Description
Save Changes and Exit>	Exits system after saving changes
Discard Changes and Exit>	Exits system setup without saving changes
Save Changes and Reset>	Resets system after saving changes
Discard Changes and Reset>	Resets system setup without saving changes
Save Changes>	Saves changes made so far for any setup options
Discard Changes>	Discards changes made so far for any setup options
Restore Defaults>	Restores/loads standard default values for all setup options
Save as User Defaults>	Saves changes made so far as user defaults
Restore User Defaults>	Restores user defaults to all setup options
UEFI Built-in EFI shell>	Attempts to launch the built-in EFI Shell

9.3. The UEFI Shell

The Kontron UEFI BIOS features a built-in and enhanced version of the UEFI Shell. For a detailed description of the available standard shell scripting, refer to the EFI Shell User Guide. For a detailed description of the available standard shell commands, refer to the EFI Shell Command Manual. Both documents can be downloaded from the EFI and Framework Open Source Community homepage (<http://sourceforge.net/projects/efi-shell/files/documents/>).



Kontron UEFI BIOS does not provide all shell commands described in the EFI Shell Command Manual.

9.3.1. Basic Operation of the UEFI Shell

The UEFI Shell forms an entry into the UEFI boot order and is the first boot option by default.

9.3.1.1. Entering the UEFI Shell

To enter the UEFI Shell, follow the steps below:

1. Power on the board.
1. Press the <F7> key (instead of) to display a choice of boot devices.
2. Choose 'UEFI: Built-in EFI shell'.

```
EFI Shell version 2.40 [5.11]
Current running mode 1.1.2
Device mapping table
Fs0      :HardDisk - Alias hd33b0b0b fs0
          Acpi (PNPOA03, 0) /Pci (1D|7) /Usb (1, 0) /Usb (1, 0) /HD (Part1, Sig17731773)
```

Press the ESC key within 5 seconds to skip startup.nsh, and any other key to continue.

3. The output produced by the device-mapping table can vary depending on the board's configuration.
4. If the ESC key is pressed before the 5 second timeout elapses, the shell prompt is shown:

```
Shell >
```

9.3.1.2. Exiting the UEFI Shell

To exit the UEFI Shell, follow one of the steps below:

1. Use the **exit** UEFI Shell command to select the boot device, in the Boot menu, that the OS will boot from.
2. Reset the board using the **reset** UEFI Shell command.

9.4. UEFI Shell Scripting

9.4.1. Startup Scripting

If the ESC key is not pressed and the timeout has run out then the UEFI Shell tries to execute some startup scripts automatically. It searches for scripts and executes them in the following order:

1. Initially searches for Kontron flash-stored startup script.
2. If there is no Kontron flash-stored startup script present then the UEFI -specified `startup.nsh` script is used. This script must be located on the root of any of the attached FAT formatted disk drive.
3. If none of the startup scripts are present or the startup script terminates then the default boot order is continued.

9.4.2. Create a Startup Script

Startup scripts can be created using the UEFI Shell built-in editor `edit` or under any OS with a plain text editor of your choice. To create a startup shell script, simply save the script on the root of any FAT-formatted drive attached to the system. To copy the startup script to the flash, use the `kBootScript` UEFI Shell command.

In case there is no mass storage device attached, the startup script can be generated in a RAM disk and stored in the SPI boot flash using the `kRamdisk` UEFI Shell command.

9.4.3. Examples of Startup Scripts

9.4.3.1. Execute Shell Script on other Harddrive

This example (`startup.nsh`) executes the shell script named `bootme.nsh` located in the root of the first detected disc drive (`fs0`).

```
fs0:  
bootme.nsh
```

10/ Technical Support

For technical support contact our Support department:

- ▶ E-mail: support@kontron.com
- ▶ Phone: +49-821-4086-888

Make sure you have the following information available when you call:

- ▶ Product ID Number (PN),
- ▶ Serial Number (SN)
- ▶ Module's revision
- ▶ Operating System and Kernel/Build version
- ▶ Software modifications
- ▶ Addition connected hardware/full description of hardware set up

Be ready to explain the nature of your problem to the service technician.



The serial number can be found on the Type Label, located on the product's rear side.

10.1. Warranty

Due to their limited service life, parts that by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law. This applies to the CMOS battery, for example.



If there is a protection label on your product, then the warranty is lost if the product is opened.

10.2. Returning Defective Merchandise

All equipment returned to Kontron must have a Return of Material Authorization (RMA) number assigned exclusively by Kontron. Kontron cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The buyer accepts responsibility for all freight charges for the return of goods to Kontron's designated facility. Kontron will pay the return freight charges back to the buyer's location in the event that the equipment is repaired or replaced within the stipulated warranty period. Follow these steps before returning any product to Kontron.

1. Visit the RMA Information website: <https://www.kontron.com/en/support/rma-information>
Download the RMA Request sheet for **Kontron Europe GmbH** and fill out the form. Take care to include a short detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product.
2. Send the completed RMA-Request form to the fax or email address given below at Kontron Europe GmbH. Kontron will provide an RMA-Number.

Kontron Europe GmbH
RMA Support
Phone: +49 (0) 821 4086-0
Fax: +49 (0) 821 4086 111
Email: service@kontron.com

3. The goods for repair must be packed properly for shipping, considering shock and ESD protection.



Goods returned to Kontron Europe GmbH in non-proper packaging will be considered as customer caused faults and cannot be accepted as warranty repairs.

4. Include the RMA-Number with the shipping paperwork and send the product to the delivery address provided in the RMA form or received from Kontron RMA Support.

Appendix A: List of Acronyms

Table 75: List of Acronyms

ACPI	Advanced Configuration Power Interface	HBR2	High Bitrate 2
API	Application Programming Interface	HDA	High Definition Audio (HD Audio)
Basic Module	COM Express® 125 x 95 Module form factor	HD/HDD	Hard Disk /Drive
BIOS	Basic Input Output System	HDMI	High Definition Multimedia Interface
BMC	Base Management Controller	HPM	PICMG Hardware Platform Management specification family
BSP	Board Support Package	I2C	Inter integrated Circuit Communications
BPP	Bit Per Pixel	IOL	IPMI-Over-LAN
CAN	Controller-area network	IOT	Internet of Things
Carrier Board	Application specific circuit board that accepts a COM Express® module	IPMI	Intelligent Platform Management Interface
COM	Computer-on-Module	KCS	Keyboard Controller Style
Compact Module	COM Express® 95x95 Module form factor	KVM	Keyboard Video Mouse
CNTG	Computer Network Transaction Group	LAN	Local Area Network
DDC	Display Data Control	LPC	Low Pin-Count Interface:
DDI	Digital Display Interface –	LVDS	Low Voltage Differential Signaling
DIMM	Dual In-line Memory Module	M.A.R.S.	Mobile Application for Rechargeable Systems
Display Port	DisplayPort (digital display interface standard)	MDI	Media Dependent Interface
DMA	Direct Memory Access	MEI	Management Engine Interface
DRAM	Dynamic Random Access Memory	Mini Module	COM Express® 84x55mm Module form factor
DVI	Digital Visual Interface	MTBF	Mean Time Before Failure
EAPI	Embedded Application Programming Interface	NA	Not Available
ECC	Error Checking and Correction	NC	Not Connected
EEPROM	Electrically Erasable Programmable Read-Only Memory	NCSI	Network Communications Services Interface
eDP	Embedded Display Port	PATA	Parallel AT Attachment
EMC	Electromagnetic Compatibility (EMC)	PCI	Peripheral Component Interface
ESD	Electro Sensitive Device	PCIe	PCI-Express
Extended Module	COM Express® 155mm x 110mm Module form factor.	PECI	Platform Environment Control Interface
FIFO	First In First Out	PEG	PCI Express Graphics
FRU	Field Replaceable Unit	PICMG®	PCI Industrial Computer Manufacturers Group
Gb	Gigabit	PHY	Ethernet controller physical layer device
GBE	Gigabit Ethernet	Pin-out Type	COM Express® definitions for signals on COM Express® Module connector pins.
GPI	General Purpose Input	PS2	Personal System 2 (keyboard & mouse)
GPIO	General Purpose Input Output	PSU	Power Supply Unit
GPO	General Purpose Output	RoHS	Restriction of Hazardous Substances
GPU	Graphics Processing Unit	RTC	Real Time Clock

SAS	Serial Attached SCSI – high speed serial version of SCSI
SATA	Serial AT Attachment:
SCSI	Small Computer System Interface
SEL	System Event Log
ShMC	Shelf Management Controller
SMBus	System Management Bus
SO-DIMM	Small Outline Dual in-line Memory Module
SOIC	Small Outline Integrated Circuit
SOL	Serial Over LAN
SPI	Serial Peripheral Interface
SSH	Secure Shell

TPM	Trusted Platform Module
UART	Universal Asynchronous Receiver Transmitter
UEFI	Unified Extensible Firmware Interface
UHD	Ultra High Definition
ULP	Ultra Low Power
USB	Universal Serial Bus
VGA	Video Graphics Adapter
VLP	Very Low Profile
WDT	Watch Dog Timer
WEEE	Waste Electrical and Electronic Equipment (directive)



About Kontron – Member of the S&T Group

Kontron is a global leader in embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

For more information, please visit: www.kontron.com



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