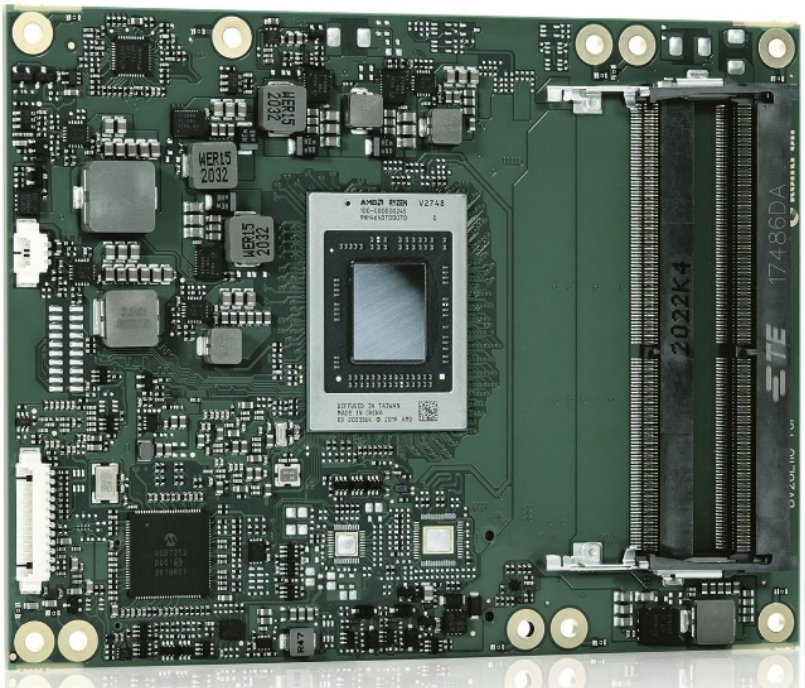
USER GUIDE



COMe-bV26

Rev. 1.1, User Guide

Doc. ID: 1068 6561

This page has been intentionally left blank

COME-BV26 – USER GUIDE

Disclaimer

Kontron would like to point out that the information contained in this user guide may be subject to alteration, particularly as a result of the constant upgrading of Kontron products. This document does not entail any guarantee on the part of Kontron with respect to technical processes described in the user guide or any product characteristics set out in the user guide. Kontron assumes no responsibility or liability for the use of the described product(s), conveys no license or title under any patent, copyright or mask work rights to these products and makes no representations or warranties that these products are free from patent, copyright or mask work right infringement unless otherwise specified. Applications that are described in this user guide are for illustration purposes only. Kontron makes no representation or warranty that such application will be suitable for the specified use without further testing or modification. Kontron expressly informs the user that this user guide only contains a general description of processes and instructions which may not be applicable in every individual case. In cases of doubt, please contact Kontron.

Kontron Europe GmbH

Gutenbergstraße 2
85737 Ismaning
Germany
www.kontron.com

Intended Use

THIS DEVICE AND ASSOCIATED SOFTWARE ARE NOT DESIGNED, MANUFACTURED OR INTENDED FOR USE OR RESALE FOR THE OPERATION OF NUCLEAR FACILITIES, THE NAVIGATION, CONTROL OR COMMUNICATION SYSTEMS FOR AIRCRAFT OR OTHER TRANSPORTATION, AIR TRAFFIC CONTROL, LIFE SUPPORT OR LIFE SUSTAINING APPLICATIONS, WEAPONS SYSTEMS, OR ANY OTHER APPLICATION IN A HAZARDOUS ENVIRONMENT, OR REQUIRING FAIL-SAFE PERFORMANCE, OR IN WHICH THE FAILURE OF PRODUCTS COULD LEAD DIRECTLY TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE (COLLECTIVELY, "HIGH RISK APPLICATIONS").

You understand and agree that your use of Kontron devices as a component in High Risk Applications is entirely at your risk. To minimize the risks associated with your products and applications, you should provide adequate design and operating safeguards. You are solely responsible for compliance with all legal, regulatory, safety, and security related requirements concerning your products. You are responsible to ensure that your systems (and any Kontron hardware or software components incorporated in your systems) meet all applicable requirements. Unless otherwise stated in the product documentation, the Kontron device is not provided with error-tolerance capabilities and cannot therefore be deemed as being engineered, manufactured or setup to be compliant for implementation or for resale as device in High Risk Applications. All application and safety related information in this document (including application descriptions, suggested safety measures, suggested Kontron products, and other materials) is provided for reference only.

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 version	2022-Jan-31	CW
1.1	Ch 3.3: GPIO update	2022-July-26	CW

Terms and Conditions

Kontron warrants products in accordance with defined regional warranty periods. For more information about warranty compliance and conformity, and the warranty period in your region, visit http://www.kontron.com/terms-and-conditions.

Kontron sells products worldwide and declares regional General Terms & Conditions of Sale, and Purchase Order Terms & Conditions. Visit http://www.kontron.com/terms-and-conditions.

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/en/support.

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/en/service.

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 informs 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.

⚠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.

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.

Table of Contents

Symbols **6**
For Your Safety **7**
High Voltage Safety Instructions 7
Special Handling and Unpacking Instruction 7
Lithium Battery Precautions 8
General Instructions on Usage **8**
Quality and Environmental Management **8**
Disposal and Recycling 8
WEEE Compliance 8
Table of Contents **9**
List of Tables **11**
List of Figures **11**
1/ Introduction **13**
1.1. Product Description 13
1.2. Product Naming Clarification 14
1.3. COM Express® Documentation 15
1.4. COM Express® Functionality 15
1.5. COM Express® Benefits 15
2/ Product Specification **17**
2.1. Module Variants 17
2.1.1. Commercial Grade Modules (0°C to +60°C) 17
2.1.2. Extended Temperature Grade Modules (E1, -25°C to +75°C) 17
2.2. Accessories 17
2.3. Functional Specification 19
2.3.1. Block Diagram 19
2.3.2. Accelerated Processing Unit (APU) 19
2.3.3. Fusion Controller Hub (FCH) 20
2.3.4. System Memory 21
2.3.5. Graphics 21
2.3.6. AUDIO 22
2.3.7. PCI Express 22
2.3.8. PCI Express Graphics 3.0 (PEG) 23
2.3.9. USB 3.1. Gen 2/USB 2.0 23
2.3.10. SATA Gen 3.0 24
2.3.11. Ethernet LAN 24
2.3.12. Storage 25
2.3.13. BIOS/Software Features 25
2.3.14. Additional Features 25
2.4. Electrical Specification 26
2.4.1. Power Supply Specification 26
2.4.2. Power Management 27
2.4.2.2. Power Supply Control 27
2.4.3. Power Supply Modes 28
2.5. Thermal Management 30
2.5.1. Heatspreader Plate Assembly 30
2.5.2. Active/Passive Cooling Solutions 30
2.5.3. Operating with Kontron Heatspreader Plate (HSP) Assembly 30

2.5.4. Operating without Kontron Heatspreader Plate (HSP) Assembly 30
2.5.5. Temperature Sensors 31
2.5.6. On-Module Fan Connector 32
2.6. Environmental Specification 33
2.7. Compliance 34
2.7.1. MTBF 34
2.8. Mechanical Specification 36
2.8.1. Module Dimensions 36
2.8.2. Module Height 36
2.8.3. Cooling Concept Dimensions 37
3/ Features and Interfaces 38
3.1. ACPI Power States 38
3.2. Fast I2C 38
3.3. GPIO 38
3.4. Hardware Monitor (HWM) 39
3.5. LPC 39
3.6. NVMe SSD Flash memory (Option) 39
3.7. Real Time Clock 39
3.8. Serial Peripheral Interface 39
3.8.1. SPI Boot 39
3.8.2. Booting the SPI Flash Chip 40
3.9. TPM 2.0 40
3.10. UART 41
3.11. Watchdog Timer (WTD) Dual Stage 41
3.11.1. Watchdog Timer Signal 42
4/ System Resources 43
4.1. I2C Bus 43
4.2. System Management (SM) Bus 43
5/ COMe Interface Connector 44
5.1. Connecting COMe Interface Connector to Carrier Board 44
5.2. X1A and X1B Signals 45
5.3. COMe Interface Connector (X1A) Pin Assignment 46
5.4. Connector X1A Row A1 - A110 46
5.5. Connector X1A Row B1 - B110 51
5.6. Connector X1B Row C1 - C110 55
5.7. Connector X1B Row D1 - D110 59
6/ UEFI BIOS 63
6.1. Starting the uEFI BIOS 63
6.2. Navigating the uEFI BIOS 63
6.3. Getting Help 64
6.4. Setup Menus 64
6.4.1. Main Setup Menu 65
6.4.2. Advanced Setup Menu 66
6.4.3. Chipset Setup Menu 82
6.4.4. Security Setup Menu 85
6.4.5. Boot Setup Menu 87
6.4.6. Save and Exit Setup Menu 88
6.5. The UEFI Shell 89
6.5.1. Entering the uEFI Shell 89

6.5.2. Exiting the uEFI Shell 89
6.6. uEFI Shell Scripting 90
6.6.1. Startup Scripting 90
6.6.2. Create a Startup Script 90
6.6.3. Example of Startup Scripts 90
6.7. Firmware Update 90
7/ Technical Support 91
7.1. Warranty 91
7.2. Returning Defective Merchandise 92
List of Acronyms 93
About Kontron – Member of the S&T Group 94

List of Tables

Table 1: Type 6 and COM-bV26 Functionality 15
Table 2: Product Number for Commercial Grade Modules (0°C to +60°C operating) 17
Table 3: Accessories 17
Table 4: AMD Embedded V-Series Processor Product Family 20
Table 5: COM-bV26 Electrical Specification 26
Table 6: Power Supply Control Settings 27
Table 7: ATX Mode Settings 28
Table 8: Single Power Supply Mode Settings 29
Table 9: Heatspreader Temperature Specification 30
Table 10: Fan Connector (3-Pin) Pin Assignment 32
Table 11: Environmental Specifications 33
Table 12: CE Compliance 34
Table 13: Country Compliance 34
Table 14: MTBF 35
Table 15: Supported Power States Function 38
Table 16: SPI Boot Pin Configuration 40
Table 17: Supported SPI Boot Flash Types 40
Table 18: Dual Staged Watchdog Timer- Time-Out Events 41
Table 19: I2C Bus Port Address 43
Table 20: SMBus Address 43
Table 21: General Signal Description 45
Table 22: Connector X1A Row A1 to A110 Pin Assignment 46
Table 23: Connector X1A Row B1 to B110 Pin Assignment 51
Table 24: Connectors X1B Row C1 to C110 55
Table 25: Connectors X1B Row D1 to D110 59
Table 26: Navigation Hot Keys Available in the Legend Bar 63
Table 27: Main Setup Menu Sub-screens and Functions 65
Table 28: Advanced Setup Menu Sub-screens and Functions 66
Table 29: Chipset Setup Menu Sub-screens and Functions 82
Table 30: Security Setup Menu Sub-screens and Functions 85
Table 31: Boot Setup Menu Sub-screens and Functions 87
Table 32: Save and Exit Setup Menu Sub-screens and Functions 88
Table 33: List of Acronyms 93

List of Figures

Figure 1: COM-bV26 Front Side 13
Figure 2: COM-bV26 Rear Side 14
Figure 3: Block Diagram COMe-bV26 19
Figure 4: Module Temperature Sensors 31

Figure 5: Fan Connector 3-Pin 32
Figure 6: MTBF De-rating Values 35
Figure 7: Module Dimensions 36
Figure 8: Module and Carrier Height 37
Figure 9: Cooling Concept Dimensions 37
Figure 10: COM-bV26 Bottom Side 44
Figure 11: Setup menu Selection Bar 64
Figure 12: Main Setup Menu 65
Figure 13: Advanced Setup Menu 66
Figure 14: Chipset Setup Menu 82
Figure 15: Security Menu Setup 85
Figure 16: Boot Setup Menu 87
Figure 17: Save and Exit Setup Menu 88

1/ Introduction

This user guide describes the COMe-bV26 module made by Kontron and focuses on describing the modules special features. Kontron recommends users to study this user guide before powering on the module.

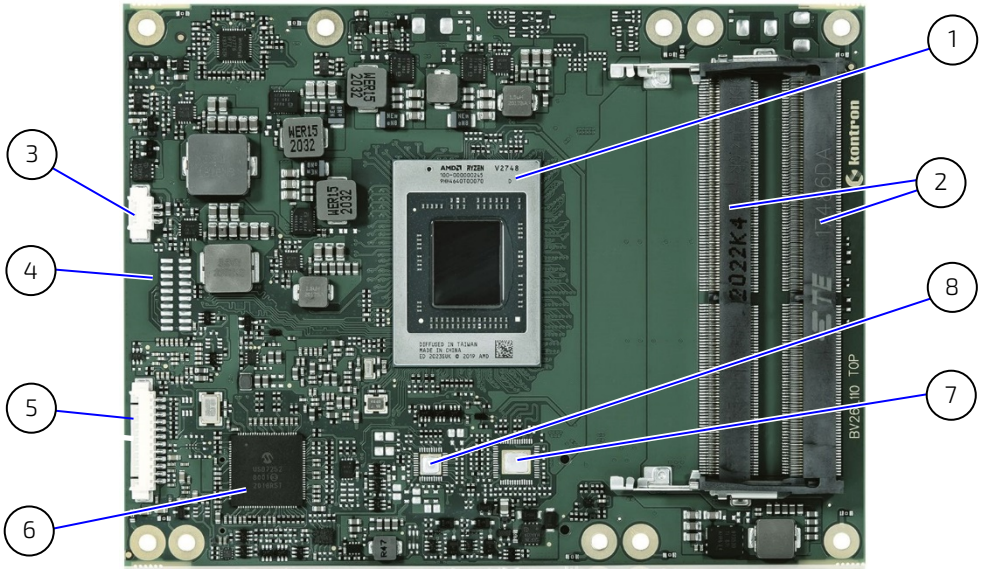
1.1. Product Description

The COMe-bV26 is a basic form factor COM Express® type 6 Computer-On-Module designed for flexible implementation within multiple embedded industrial environments. The COMe-bV26 is based on the AMD embedded V- Series (V2000) high performance "ZEN2" processor with an integrated Graphics Processing Unit (GPU) and Fusion Controller Hub (FCH) on a single chip known as Accelerated Processing Unit (APU).

Key features are:

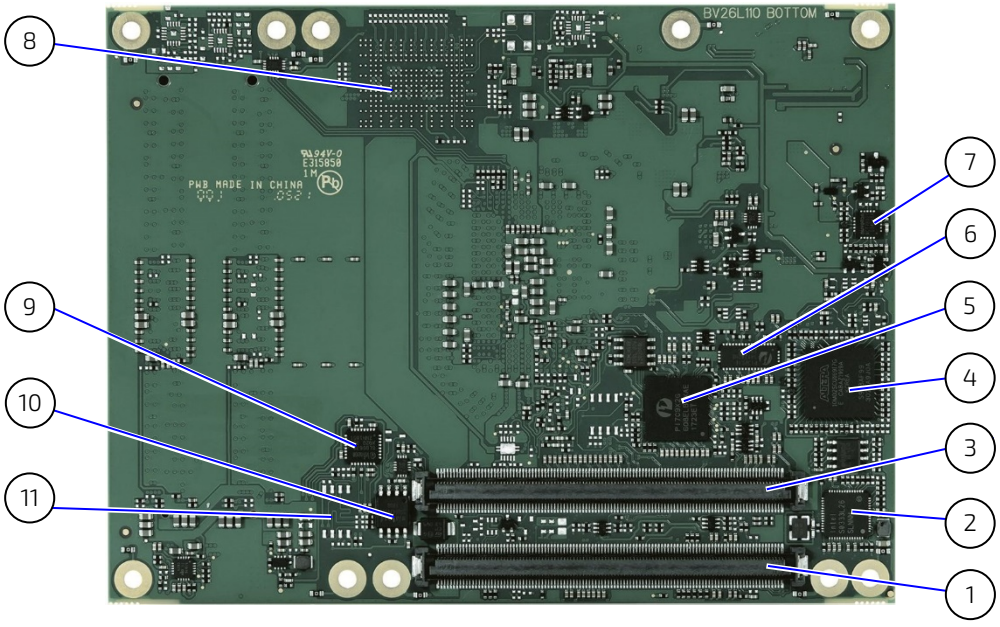
- AMD embedded V-2000 series high performance ZEN2 processor
- Basic form-factor COM Express® Basic Type 6 pinout, compatible with PICMG COM.0 Rev 3.0 spec
- Up to 64 GByte DDR4 memory
- High-speed connectivity: 4x PCIe Gen 3 Express, 1x 2.5 GbE, 4x USB 3.1 Gen 2 + 4x USB 2.0, 2x SATA Gen 3
- Support for Industrial and commercial temperature grade environments

Figure 1: COM-bV26 Front Side



1	Accelerated Processing Unit (APU)	5	Programming connector for embedded controller
2	2x SO-DIMM memory sockets	6	USB 3.1 Gen2 hub
3	3-pin fan connector	7	Display port to LVDS bridge (optional)
4	JTAG port (for internal debugging only)	8	Display port to VGS bridge (optional)

Figure 2: COM-bV26 Rear Side



1	COMe interface connectors (X1A)	6	SATA mux
2	GBE0- Ethernet Controller	7	Hardware Monitor (HWM)
3	COMe interface connectors (X1B)	8	NVME (optional)
4	Embedded controller	9	TPM 2.0
5	PCIe switch	10	SPI-Flash (BIOS/EFI)
		11	Second SPI Flash (optional)

1.2. Product Naming Clarification

COM Express® defines a Computer-On-Module (COM), with all the components necessary for a bootable host computer, packaged as a super component. The product name for Kontron COM Express® Computer-On-Modules consists of:

- Industry standard short form
  - COMe-
- Module form factor
  - b=basic (125mm x 95mm)
  - c=compact (95mm x 95mm)
  - m=mini (84mm x 55mm)
- Processor family identifier
  - EL
- Pinout type
  - Type 10
  - Type 7
  - Type 6
- Available temperature variants
  - Commercial
  - Extended (E1)
- Processor Identifier
- Chipset identifier (if assembled)

- Memory size
- Memory module (#G) /eMMC pseudo SLC memory (#S)

1.3. COM Express® Documentation

The COM Express® specification defines the COM Express® module form factor, pinout and signals. For more information about the COM Express® specification, visit the PCI Industrial Computer Manufacturers Group (PICMG®) website.

1.4. COM Express® Functionality

All Kontron COM Express® basic modules contain two 220-pin connectors, each of which has two rows called row A & B on the primary connector and row C & D on the secondary connector. The COM Express® basic type 6 Computer-On-Module (COM) features the following maximum amount of interfaces according to the PICMG module pinout type.

Table 1: Type 6 and COM-bV26 Functionality

Feature	Type 6	COM-bV26
HD Audio	1x	1x
Gbit Ethernet	1x	1x up to 2.5 GbE
Serial ATA Gen3	4x	4x
PCI Express x 1	4x	4x PCIe Gen 3 and 4x PCIe Gen 2
PCI Express x16 (PEG)	1x	1x (x8 PEG)
USB Client	-	4x
USB	4x USB 3.0/2.0 8x USB 2.0	4x USB 3.1 Gen 2/USB 2.0 8x USB 2.0 (4x dedicated USB 2.0)
VGA	1x	1x (option)
LVDS (eDP)	1x LVDS dual channel	eDP or option for LVDS
DP++ (DP/HDMI/DVI)	3x	3x
SPI	1x	1x
LPC	1x	1x (used for external LPC on carrier board)
External SMB	1x	1x
External I2C	1x	1x
SDIO shared with GPIO	1x option	-
GPIO or SDIO	8x	8x GPIO
UART (2-wire COM)	2x	2x
FAN PWM out	1x	1x

1.5. COM Express® Benefits

COM Express® defines a Computer-On-Module (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 module is based on the COM Express® specification. This standardization allows designers to create a single-system carrier board that can accept present and future COM Express® modules.

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

A single carrier board 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® carrier board can work with several successive generations of COM Express® modules.

A COM Express® carrier board design has many advantages of a customized computer-board design and, additionally, delivers better obsolescence protection, heavily reduced engineering effort, and faster time to market

2/ Product Specification

2.1. Module Variants

The COMe-bV26 is available in different processor, memory and temperature variants to cover demands in performance, price and power. The following tables list the module variants for the temperature grades.

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

Commercial Grade Modules (0°C to +60°C) are available as a standard product number.

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

Product Number	Product Name	Description
38036-0000-29-8	COMe-bV26 V2748	COM Express® basic pin-out type 6 Computer-on-Module with AMD V2748, 8x2.9GHz, 2x DDR4 non-ECC/ECC SO-DIMM
38036-0000-17-8	COMe-bV26 V2718	COM Express® basic pin-out type 6 Computer-on-Module with AMD V2718, 8x1.7GHz, 2x DDR4 non-ECC/ECC SO-DIMM
38036-0000-30-6	COMe-bV26 V2546	COM Express® basic pin-out type 6 Computer-on-Module with AMD V2546, 6x3.0GHz, 2x DDR4 non-ECC/ECC SO-DIMM
38036-0000-21-6	COMe-bV26 V2516	COM Express® basic pin-out type 6 Computer-on-Module with AMD V2516, 6x2.1GHz, 2x DDR4 non-ECC/ECC SO-DIMM

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.

2.2. Accessories

Accessories are product specific, COMe-type 6 specific, or general COMe accessories. For more information, contact your local Kontron Sales Representative or Kontron Inside Sales.

Table 3: Accessories

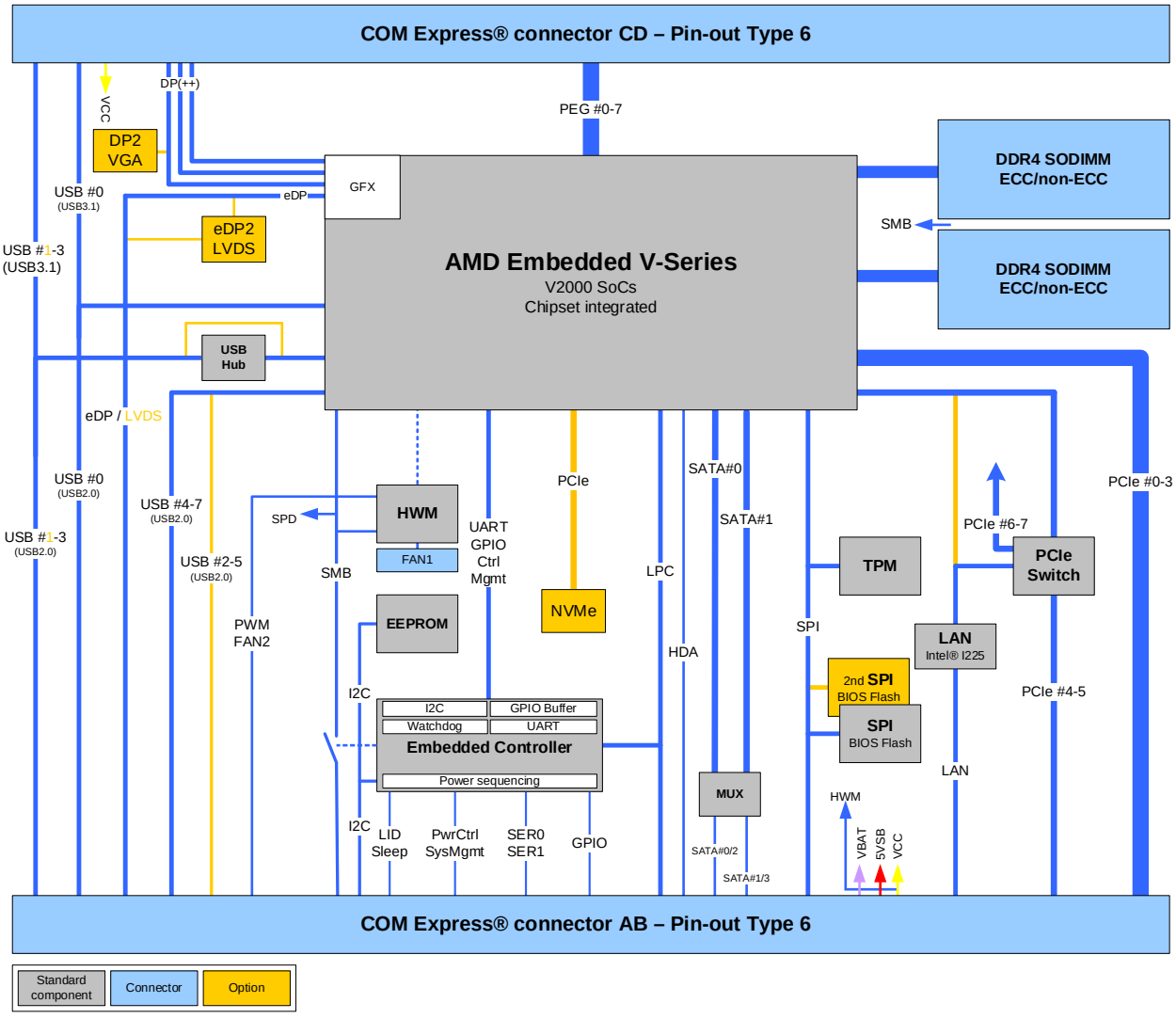
Part Number	Carrier	Description
38115-0000-00-x	COM Express® REFERENCE CARRIER –I TYPE 6	Thin-mITX carrier with 5 mm COMe connector
38116-0000-00-5	COM Express® EVAL CARRIER2 TYPE 6	ATX carrier with 5 mm COMe connector
Part Number	**Heatspreader**	**Description**
38036-0000-99-0	HSP COMe-bV26 CU CORE THREADED	Heatspreader for COMe-bV26, Cu-core, threaded mounting holes
38036-0000-99-1	HSP COMe-bV26 CU-CORE THROUGH	Heatspreader for COMe-bV26, Cu -core, through mounting holes
Part Number	**Fan Cables**	**Description**
96079-0000-00-0	KAB-HSP 200 mm	Cable adapter to connect fan to module (COMe Basis/Compact/Mini)
96079-0000-00-2	KAB-HSP 40 mm	Cable adapter to connect fan to module (COMe Basis/Compact/Mini)

Part Number	Memory	Description
97020-0432-BV26	DDR4-3200 SODIMM 4GB_BV26	DDR4-3200 4 GByte, no ECC
97020-0832-BV26	DDR4-3200 SODIMM 8GB_BV26	DDR4-3200 8 GByte, no ECC
97020-1632-BV26	DDR4-3200 SODIMM 16GB_BV26	DDR4-3200 16 GByte, no ECC
97020-3232-BV26	DDR4-3200 SODIMM 32GB_BV26	DDR4-3200 32 GByte, no ECC
97030-0432-BV26	DDR4-3200 SODIMM 4GB ECC_BV26	DDR4-3200 4 GByte, with ECC
97030-0832-BV26	DDR4-3200 SODIMM 8GB ECC_BV26	DDR4-3200 8 GByte, with ECC
97030-1632-BV26	DDR4-3200 SODIMM 16GB ECC_BV26	DDR4-3200 16 GByte, with ECC
97030-3232-BV26	DDR4-3200 SODIMM 32GB ECC_BV26	DDR4-3200 32 GByte, with ECC

2.3. Functional Specification

2.3.1. Block Diagram

Figure 3: Block Diagram COMe-bV26



2.3.2. Accelerated Processing Unit (APU)

The AMD embedded V-series (V2000) combines Processor, Graphics processing Unit (GPU) and Fusion Controller Hub (FCH) in a single chip APU, 7-nanometer FP6 BGA package:

The processor variants support the following technologies:

- DirectX®12
- OpenCL®
- OpenGL
- Vulkan ™ API

The following table lists the specification of the COMe-bV26 processor variants.

Table 4: AMD Embedded V-Series Processor Product Family

AMD Embedded V-Series ZEN2	V2748	V2718	V2546	V2516
# of Cores	8	8	6	6
# of Threads	16	16	12	12
Base Frequency	2.9 GHz	1.7 GHz	3.0 GHz	2.1 GHz
Turbo Frequency	4.25 GHz	4.15 GHz	3.95 GHz	3.95 GHz
Operating temperature	0°C to 105°C	0°C to 105°C	0°C to 105°C	0°C to 105°C
Thermal Design Power (TDP) Range	35 W to 54 W	10 t0 25 W	35 W to 54 W	10 W to 25 W
Max. Memory speed	DDR4 3200 MHz	DDR4 3200 MHz	DDR4 3200 MHz	DDR4 3200 MHz
Max. Memory size	64 GB (2x32 GB)	64 GB (2x32 GB)	64 GB (2x32 GB)	64 GB (2x32 GB)
Memory Controller	Dual Channel	Dual Channel	Dual Channel	Dual Channel
ECC memory Support	Yes	Yes	Yes	Yes
GPU Band	AMD Radeon™ Graphics	AMD Radeon™ Graphics	AMD Radeon™ Graphics	AMD Radeon™ Graphics
GPU Max.	1600 MHZ	1600 MHZ	1500 MHZ	1500 MHZ
GPU CU	7	7	6	6
Displays	4	4	4	4
PCIe Lanes	20 Lanes Gen 3	20 Lanes Gen 3	20 Lanes Gen 3	20 Lanes Gen 3
USB	4x USB 2.0 4x USB 3.1 Gen 2	4x USB 2.0 4x USB 3.1 Gen 2	4x USB 2.0 4x USB 3.1 Gen 2	4x USB 2.0 4x USB 3.1 Gen 2
SATA	2	2	2	2
Low Speed Interface	GPIO, I2C, LPC, SMBus, SPI, UART, SoundWire	GPIO, I2C, LPC, SMBus, SPI, UART, SoundWire	GPIO, I2C, LPC, SMBus, SPI, UART, SoundWire	GPIO, I2C, LPC, SMBus, SPI, UART, SoundWire

For specific COMe-bV26 features, see the relevant section within this chapter. Processor features listed in Table 4, may not be compatible with COMe-bV26 features.

2.3.3. Fusion Controller Hub (FCH)

The COMe-bV26's APU includes an integrated FCH.

2.3.4. System Memory

The COMe-bV26 supports up to 64 GByte of SODIMM memory with dual DDR4-3200.

System Memory	Description
Socket	2x DDR4 SODIMM
Type	DDR4-3200 ECC
Size (Max.)	64 GByte (2x32 GByte)
Technology	Dual channel
Memory Speed	3200 MTs (max.)
ECC[1]	In-band ECC

[1] In band ECC improves safety and reliability by providing ECC protection to specific regions of the physical memory. Out of band ECC is not supported.

The two SODIMM memory sockets are located on the top side of the module where socket one is 4 mm height and socket two is 8 mm high. Each socket may be populated with a DDR4 DIMM module mounted horizontally.

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 motherboard. Kontron guarantees to maintain memory modules by replacing EOL memory modules with another qualified similar module.

As a minimum, it is recommended to use Kontron memory modules for prototype system(s) in order to prove the stability of the system and as a reference.

For volume production, if required, test and qualify other types of RAM. 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 Table 3: Accessories

2.3.5. Graphics

The COMe-bV26 supports up to four simultaneous displays on the Digital Display Interface (DDIO) using the processor's graphics controller with VEGA 6 and VEGA7 graphics core architecture supporting up to seven GPU core counts, depending on the processor. LVDS is supported as an option using an eDP to LVDS bridge chip and VGA is supported as an option using a Display Port (DP) to VGA bridge chip.

The following table list the display features.

COMe Port	APU Port	Resolution	Description
DDI1	DP3	Up to 4K	DP 1.4 V (DP++) with Audio
DDI2	DP1	Up to 4 K	DP 1.4 V (DP++) with Audio / Option for VGA signal with VGA video and VGS DCC
DDI3	DP2	Up to 4 K	DP 1.4 V (DP++) with Audio
eDP	DP0	4096 x 2096 x 2160 @ 60 Hz	eDP or Option for LVDS dual channel 18/24 bit

Supported flat panels with Extended Display Identification Data (EDID)/DisplayID.

Kontron recommends only using a DP-to-HDMI or DP-to-DVI passive adapter that is complaint to the DP Dual-Mode standard. If adapters are used with FET level shifter for DCC translation, display detection issues may occur.

To increase link margin, at 4K resolution a DP redriver on the carrier is recommended

2.3.6. AUDIO

The COMe-bV26 supports default processor audio and an external HD Audio codec on the carrier board.

2.3.7. PCI Express

The COMe-bV26 features up to four PCIe Gen3 lanes [0-3] and up to four PCIe Gen 2 lanes [4-7] using a PCIe switch connected to one of the processor's PCIe lanes.

The following table lists the supported standard PCI Express Gen 3 lane configurations.

COMe Connector	GPP Lane #	Supported Lane Configuration		
		4x1	2x2	1x4
PCIE_0	4	x1	x2	x4
PCIE_1	5	x1		
PCIE_2	6	x1	x2	
PCIE_3	7	x1		

The following table lists the supported PCI Express switch Gen 2 lane configurations.

COMe Connector	PCIe Switch Lane #	Supported Lane Configuration
		4x1
PCIE_4	4	x1
PCIE_5	5	x1
PCIE_6	6	x1
PCIE_7	7	x1

To change the default PCIe configuration (8 x1), a new BIOS version is required. For BIOS version information, see Kontron's Customer Section or contact Kontron Support.

For the COMe-bV26 option without the PCIe Switch, LAN is directly connected to processor PCIe, see Figure 3: Block Diagram COMe-bV26.

2.3.8. PCI Express Graphics 3.0 (PEG)

The following table lists the supported PCI Express Graphics (PEG) lane configurations.

COMe Connector	GPP Lane #	Supported Lane Configuration	
		2x4	1x8
PEG_0	0	x4 (option)	x8
PEG_1	1		
PEG_2	2		
PEG_3	3		
PEG_4	4	x4 (option)	
PEG_5	5		
PEG_6	6		
PEG_7	7		

PCIe allows for lane reversal between the host and the target device.
Prerequisite: the lanes are sequentially ordered when reversed.

2.3.9. USB 3.1. Gen 2/USB 2.0

The COMe-bV26 supports up to four USB 3.1 Gen 2 (10 Gb/s) ports by implementing a USB hub and/or a maximum of up to eight USB 2.0 ports where four ports are dedicated USB 2.0 ports.

The following table lists the supported USB features.

USB ports	4x USB 3.1 Gen 2 (10 Gb/s) / USB 2.0 backwards compatible 4x USB 2.0 (dedicated)
USB Over Current Signals	4x

The USB port configuration varies depending on implementation of a USB Hub.

The following table lists the USB port connections.

COMe Connector	USB Ports (default: with hub)		USB Ports (option 1: without hub)		USB Ports (option 2: without hub)	
	USB 3.1 Gen 2	USB 2.0 (dedicated)	USB 3.1 Gen 2	USB 2.0 (dedicated)	USB 3.1 Gen 2	USB 2.0 (dedicated)
USB0	USB SS0		USB SS0		USB SS0	
USB1	USB SS1: 3 hub		USB SS1		USB SS1	
USB2				(NC)		USB6
USB3				(NC)		USB7
USB4		USB2		USB2		USB2
USB5		USB3		USB3		USB3
USB6		USB6		USB6		(NC)
USB7		USB7		USB7		(NC)

2.3.10. SATA Gen 3.0

The COMe-bV26 supports up to two SATA (6 Gb/s) lanes, [SATA_0 and SATA_1]. Alternatively, using a multiplexer IC two SATA (6 Gb/s) lanes [SATA_2 and SATA_3] may be connected to the COMe pinout.

The following table lists the SATA port connections.

COMe Connector	GPP lane #	Description
SATA_0	2	SATA GEN 3, 6 Gb/s
SATA_1	3	SATA GEN 3, 6 Gb/s
SATA_2	Mux. to GPP2/SATA_0	SATA GEN 3, 6 Gb/s
SATA_3	Mux. to GPP3/SATA_1	SATA GEN 3, 6 Gb/s

Using a multiplexer IC two SATA signals from the processor may be connected, SATA_0 and SATA_1 or SATA_2 and SATA_3 to the COMe pinout.

2.3.11. Ethernet LAN

The COMe-bV26 supports one 10/100/1000Base-T or 2.5 GbE Ethernet controller port.

The following table lists the Ethernet port connections.

COMe Connector	PCIe Switch Lane #	Description
GBE0	1	up to 2.5 GbE, Intel I225 Ethernet controller

For the 2.5 GbE Ethernet port speed, ensure the use of a compatible connector.

It is not recommended to use an integrated RJ45 connector module with the center tap shorted together with all the 4 pairs at the center-tap transformer. This increases the common mode noise and may create EMI. If this type of Integrated Connector module (ICM) is chosen, it is recommended to add in a discrete common choke in series to each PHY MDI differential line pairs.

For the COMe-bV26 option without the PCIe Switch, LAN is directly connected to processor PCIe, see Figure 3: Block Diagram COMe-bV26.

2.3.12. Storage

The following table lists the storage features:

Storage	Description
NVMe SSD	1x up to 1 TByte NVMe SSD NAND Flash (option)
Embedded EEPROM (Eeep)	1x Eeep (EEPROM available on I2C bus, address A0h)

2.3.13. BIOS/Software Features

The following table lists the supported BIOS and software features.

BIOS EFI	AMI UEFI (incl. support for AMI tools)
Software	Demo Utility for KEAPI usage for all supported OS BIOS/ EFI Flash Utility for EFI shell, Windows 10 and Linux BIOS/EFI Utility to configure PCIe mapping BIOS/EFI Utility for users to implement Boot Logo and customized NVRA setup
Operating Systems	Board Support Packages for: ▶ Windows 10 ▶ Linux (Yocto based)
Custom BIOS Settings/ Flash Backup	Supported

2.3.14. Additional Features

The following table lists General, Special and Optional COMe-bV26 features.

General Features	
Fast I2C	Connected to module EEPROM, carrier EEPROM and RTC clock
LID Signal	Supported
LPC	Used for external LPC on carrier board
RTC	Supported
Sleep Signal	Supported
SM Bus	Supported
SPI	Dedicated SPI for TPM and Flash memory
TPM 2.0	1x TPM 2.0 (hardware or firmware, selectable in BIOS setup)
Watchdog Support	Dual Staged

Special Kontron Features	
Embedded API	KEAPI 3.0 for all supported OS KEAPI packages are included in reference image

Optional Features	
LVDS instead of eDP	eDP signals can be overlaid with LVDS signals using an eDP to LVDS bridge
NVMe SSD NAND Flash	Up to 1 TByte
UART	2x RX/TX
VGA	Instead of DDI2 DP++ (option)
2nd SPI BIOS	For additional safety, enabling BIOS recovery if the first SPI chip fails.

2.4. Electrical Specification

The module powers on by connecting to a carrier board via the COMe interface connector. Before connecting the module to the carrier board, ensure that the carrier board is switch off and disconnected from the main power supply at the time of connection. Failure to disconnect the main power supply from the carrier board could result in personal injury and damage to the module and/or carrier board. The COMe interface connector pins on the module limits the amount of power received.

⚠CAUTION

The module powers on by connecting to the carrier board using the interface connector. Before connecting the module's interface connector to the carrier board's corresponding connector, ensure that the carrier board is switch off and disconnected from the main power supply. Failure to disconnect the main power supply could result in personal injury and damage to the module and/or carrier board.

⚠CAUTION

Observe that only trained personnel aware of the associated dangers connect the module, within an access controlled ESD-safe workplace.

2.4.1. Power Supply Specification

The power specification of the module supports a supply voltage of 12 V (single power rail voltage) and a wide input voltage range of 8.5 V to 20 V. Other supported voltages are 5 V standby and 3.3 V RTC battery input.

Table 5: COM-bV26 Electrical Specification

Supply Voltage (VCC) (range)	8.5 V to 20 V
Supply Voltage (VCC) (nominal)	12 V
Standby Voltage	5 V ±5 % [1]
RTC Voltage	2.8 V to 3.47 V

[1] 5 V Standby voltage is not mandatory for operation

⚠CAUTION

Only connect to an external power supply delivering the specified input rating and complying with the requirements of Safety Extra Low Voltage (SELV) and Limited Power Source (LPS) of UL/IEC 60950-1 or (PS2) of UL/IEC 62368-1.

NOTICE

To protect external power lines of peripheral devices, make sure that the wires have the right diameter to withstand the maximum available current and the enclosure of the peripheral device fulfils the fire-protection requirements of IEC/EN 62368-1.

NOTICE

If any of the supply voltages drops below the allowed operating level longer than the specified hold-up time, all the supply voltages should be shut down and left OFF for a time long enough to allow the internal board voltages to discharge sufficiently.

If the OFF time is not observed, parts of the board or attached peripherals may work incorrectly or even suffer a reduction of MTBF. The minimum OFF time depends on the implemented PSU model and other electrical factors and must be measured individually for each case.

2.4.1.1. Power Supply Voltage Rise Time

The input voltage rise time is 0.1 ms to 20 ms from input voltage ≤10% to nominal input voltage. 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.

2.4.1.2. Power Supply Voltage Ripple

The maximum power supply voltage ripple and noise is 100 mV peak-to-peak measured over a frequency bandwidth of 0 MHz to 20 MHz. The voltage ripple must not cause the input voltage range to be exceeded.

2.4.1.3. Power Supply Inrush Current

The maximum inrush current at 5 V standby is 2 A. From states G3 (Module is mechanically completely off, with no power consumption) or S5 (module appears to be completely off) to state S0 (module is fully usable) the maximum inrush current meets the SFX Design Guide.

2.4.2. Power Management

The COM-bV26 implements the Advanced Configuration and Power Interface (ACPI) 6.0 hardware specification with features such as power button and suspend states. The Power management options are available within the BIOS set up menu: Advance>ACPI Settings>.

2.4.2.1. Suspend States

If power is removed, 5 V can be applied to the V_5V_STBY pins to support the ACPI suspend-states:

- Suspend to RAM (S3)
- Suspend-to-Disk (S4)
- Soft-off state (S5)

If power is removed, the wake-up event (S0) requires 12 V VCC to power on the module.

2.4.2.2. Power Supply Control Settings

Power supply control settings are set in the BIOS and enable the module to shut down, rest and wake from standby.

Table 6: Power Supply Control Settings

COMe Signal	Pin	Description
Power Button (PWRBTN#)	B12	A PWRBTN# falling edge signal creates power button event (50 ms ≤ t < 4 s, typical 400 ms) at low level). Power button events can be used to bring a system out of S5 soft-off and other suspend states, as well as powering the system down. Pressing the power button for at least four seconds turns off power to the module Power Button Override
Power Good (PWR_OK)	B24	Indicates that all power supplies to the module are stable within specified ranges. PWR_OK signal goes active and module internal power supplies are enabled. PWR_OK can be driven low to prevent module from powering up until the carrier is ready and releases the signal. PWR_OK should not be deactivated after the module enters S0 unless there is a power fail condition.

COMe Signal	Pin	Description
Reset Button (SYS_RESET#)	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 enter the idle state before forcing a reset, even though activity is still occurring. Once reset is asserted, it remains asserted for 5 ms to 6 ms regardless of whether the SYS_RESET# input remains asserted or not.
Carrier Board Reset(CB Reset#)	B50	When the "CB Reset" from module to carrier is active low, the module outputs a request to the carrier board to reset.
SM-Bus Alert (SMB_ALERT#)	B15	When an external battery manager is present and SMB_ALERT # connected, the module always powers on even if the BIOS switch "After Power Fail" is set to "Stay Off".
Battery low (BATLOW#)	A27	BATLOW# Indicates that the external battery is low and provides a battery-low signal to the module for orderly transitioning to power saving or power cut-off ACPI modes.
Wake Up Signal WAKE[0:1]	B66, B67	Indicates PCIe wake up signal "Wake 0" or general purpose wake up signal "Wake 1"
Suspend Control (SUS_STAT#)	B18	SUS_STAT# indicates an imminent suspend operation. Used to notify LPC devices.

After a complete power loss (including battery voltage), there is an additional cold reset. This additional reset will not happen on any subsequent warm or cold reboots.

2.4.3. Power Supply Modes

The COM-bV26 supports single power supply mode and ATX power supply mode. To change the power supply mode set the ATX and single power supply controls as described in the following sections.

2.4.3.1. ATX Power Supply Mode

To start the module in ATX mode, connect VCC and 5V Standby from an ATX PSU. As soon as the standby rail ramps up the module's FCH enters the S5 state and starts the transition to S0. SUS_S3# (usually connected to PSU PS_ON#) turns on the main power rail (VCC). As soon as the PSU indicates that the power supply is stable (PWR_OK high) the FCH continues the transition to S0. The input voltage must always be higher than 5V standby (VCC>5VSB) for modules supporting a wide input voltage range down to 8.5V.

Table 7: ATX Mode Settings

State	PWRBTN#	PWR_OK	V5_Standby	PS_ON#	VCC
G3	x[1]	x[1]	0V	x[1]	0V
S5	high	low	5V	high	0V
S5 → S0	PWRBTN Event	low → high	5V	high →	0V→ VCC
S0	high	high	5V	low	VCC

[1] Defines that there is no difference if connected or open.

2.4.3.2. Single Power Supply Mode

To start the module in single power supply mode, connect VCC power and open PWR-OK at the high level. VCC can be 8.5 V to 20 V. To power on the module from S5 state, press the power button or reconnect VCC.

Table 8: Single Power Supply Mode Settings

State	PWRBTN#	PWR_OK	V5_Standby	VCC
G3	0V/x[1]	0V/x[1]	0V/x[1]	0V/x[1]
S5	high	open / high	open	VCC
S5 → S0	PWRBTN Event	open / high	open	reconnecting VCC
G3 → S0	high	open / high	open	connecting VCC

[1] Defines that there is no difference if connected or open.

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

2.5. Thermal Management

2.5.1. Heatspreader Plate Assembly

A heatspreader plate (HSP) assembly is NOT a heat sink. The heatspreader plate works as a COM Express® standard thermal interface to be used in conjunction 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 grade modules (E1)

A Thermal Interface Material (TIM) is pre-applied to the processor to aid heat transfer to the heatspreader plate when installed.

2.5.2. Active/Passive Cooling Solutions

Both active and passive thermal management approaches can be used with the heatspreader plate. The optimum cooling solution depends on the COM Express® application and environmental conditions. Kontron's active or passive cooling solutions are designed to cover the power and thermal dissipation for a commercial temperature range used in housing with a suitable airflow. For more information concerning possible cooling solutions, see Table 3: Accessories.

2.5.3. Operating with Kontron Heatspreader Plate (HSP) Assembly

The operating temperature requirements are:

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

Table 9: Heatspreader Temperature Specification

Temperature Grade	Requirements
Commercial Grade	at 60°C HSP temperature on MCP @ 100% load needs to run at nominal frequency
Extended Temperature Grade (E1)	at 75°C HSP temperature the MCP @ 50% load is allowed to start throttling for thermal protection

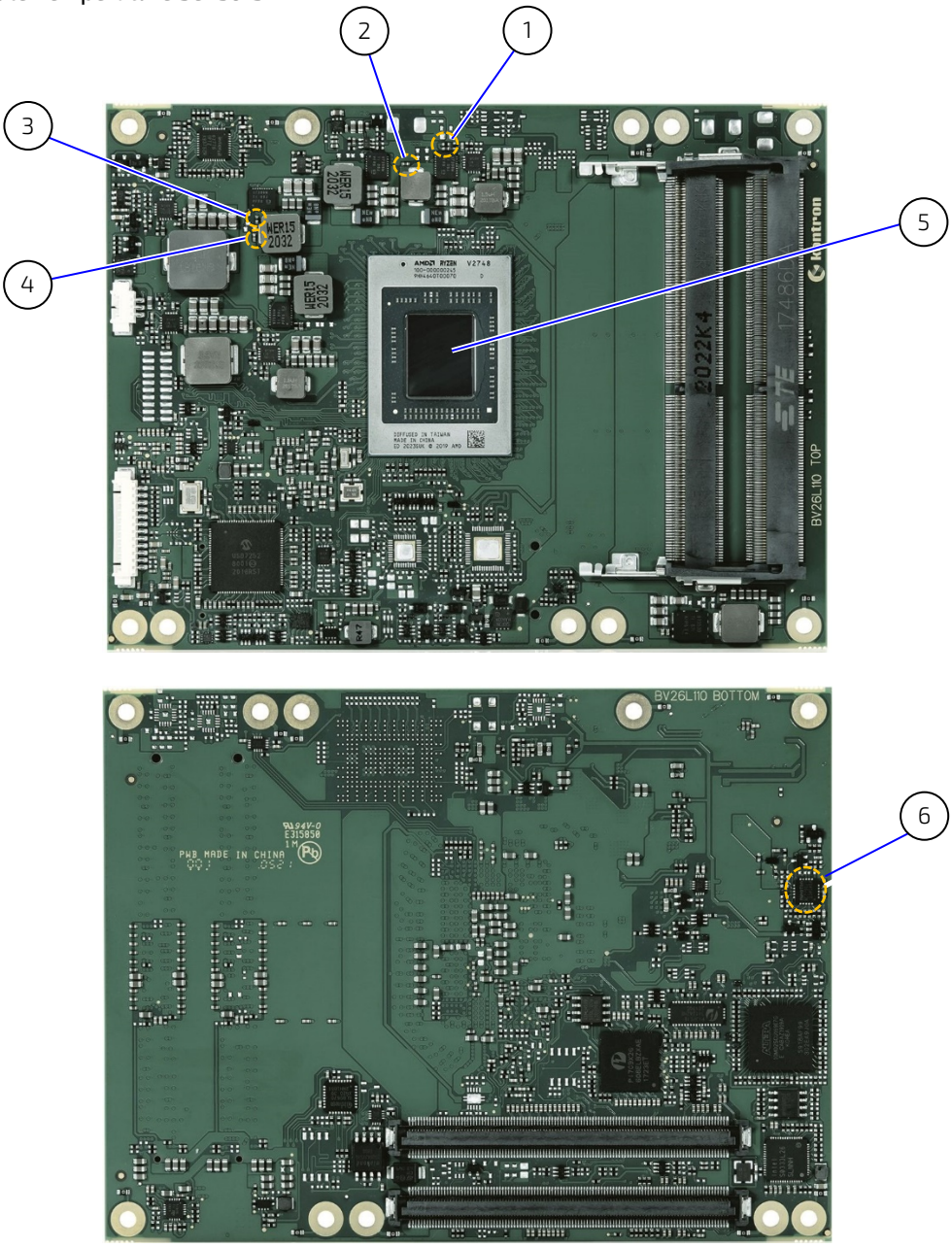
2.5.4. Operating without Kontron Heatspreader Plate (HSP) Assembly

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

2.5.5. Temperature Sensors

The on-module thermal resistors measure the processor's temperature. The thermal resistors are not capable of measuring very fast rises and falls in temperature and measurements may show a certain non-linearity. The thermal resistors give a general indication of the ambient temperature close to the processor. These differences are due to the design and are not to be considered as an error. The on-module Hardware Monitor (HWM) chip uses an on-chip temperature sensor to measure the module's temperature.

Figure 4: Module Temperature Sensors

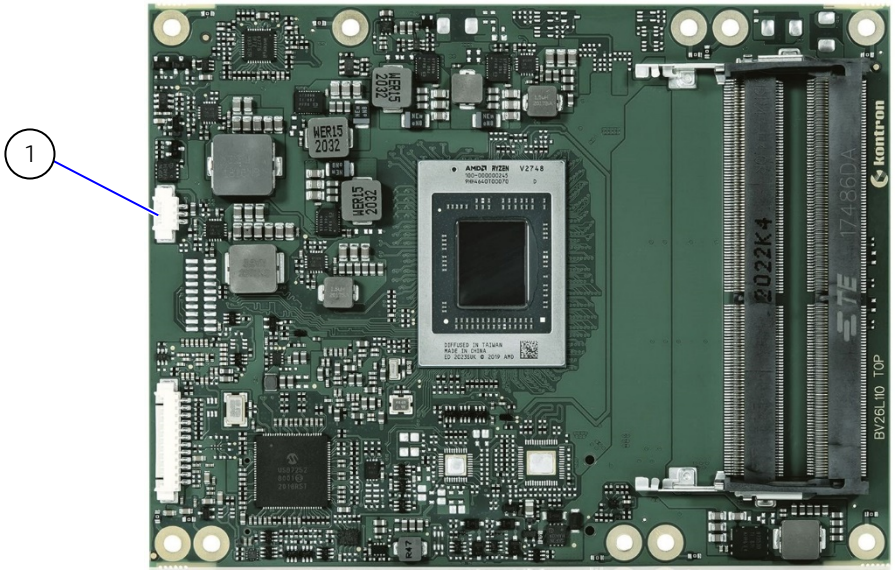


1	Thermal resistor RT5	4	Thermal resistor RT3
2	Thermal resistor RT2	5	Processor
3	Thermal resistor RT4	6	HWM- module temperature

2.5.6. On-Module Fan Connector

The fan connector powers, controls and monitors an external fan. To connect a standard 3-pin connector fan to the module, use Kontron's fan cable, see Table 3: Accessories.

Figure 5: Fan Connector 3-Pin



1 3-pin fan connector

Table 10: Fan Connector (3-Pin) Pin Assignment

Pin	Signal	Description	Type
1	Fan_Tach_IN#	Fan input voltage from COMe connector	Input
2	V_FAN	12 V ±10% (max.) across module input range	PWR
3	GND	Power GND	PWR

If the input voltage is below or equal to 13 V, then the maximum supply current to the on-module fan connector is 350 mA. The maximum supply current is reduced to 150 mA if the input voltage to the module is between 13 V and 20 V.

NOTICE

Always check the fan specification according to the limitations of the supply current and supply voltage.

2.6. Environmental Specification

The COMe-bV26 supports two temperature grades commercial and extended (E1). For temperature grade information, see Chapter 2.1: Module Variants.

Table 11: Environmental Specifications

Environmental		Description
Commercial Grade	Operating	0°C to +60°C (32°F to 140°F)
	Non-operating	-30°C to +85°C (-22°F to 185°F)
Extended Grade (E1)	Operating	-25°C to +75°C (-13°F to 167°F)
	Non-operating	-30°C to +85°C (-22°F to 185°F)
Relative Humidity (according to IEC 60068-2-78)		93 % @ 40°C, non-condensing
Shock (according to IEC / EN 60068-2-27)		Non-operating shock test (half-sinusoidal, 11 ms, 15 g)
Vibration (according to IEC / EN 60068-2-6)		Non-operating vibration (sinusoidal, 10 Hz – 2000 Hz, +/- 0.15 mm, 2 g)

2.7. Compliance

The COMe-bV26 complies with the following or the latest status thereof. If modified, the prerequisites for specific approvals may no longer apply. For more information, contact Kontron Support.

Table 12: CE Compliance

Europe – CE Mark	
Directives	**2014/30/EU**: Electromagnetic Compatibility **2014/35/EU**: Low Voltage **2011/65/EU + 2015/863/EU + 2017/2102/EU**: RoHS II **2001/95/EC**: General Product Safety
EMC	**EN 55032 (CISPR 32)** Electromagnetic Compatibility of multimedia equipment- Emission Requirements **EN61000-6-2** Electromagnetic Compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments
Safety	**EN 62368-1** Audio/video, information and communication technology equipment - Part 1: Safety requirements

The COMe-bV26 complies with the following country specific certifications:

Table 13: Country Compliance

USA/CANADA	
Safety	**UL 62368-1 & CSA C22.2 No. 62368-1 (Component Recognition)** Audio/video, information and communication technology equipment - Part 1: Safety requirements 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
UK CA Mark	
EMC	**BS EN 55032** Electromagnetic compatibility of multimedia equipment- Emission Requirements **BS EN 61000-6-2** Electromagnetic Compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments
Safety	**BS EN 62368-1** Audio/video, information and communication technology equipment - Part 1: Safety requirements
CB Scheme (For International Certifications)	
Safety	**IEC 62368-1** Audio/video, information and communication technology equipment - Part 1: Safety requirements

2.7.1. MTBF

The MTBF (Mean Time Before Failure) values were calculated using a combination of the manufacturer's test data, (if available) and the Telcordia (Bellcore) issue 2 calculation for the remaining parts.

The Telcordia calculation used is “Method 1 Case 3” in a ground benign, controlled environment. This particular method takes into account varying temperature and stress data and the system is assumed to have not been burned-in. Other environmental stresses (such as extreme altitude, vibration, salt-water exposure) lower MTBF values.

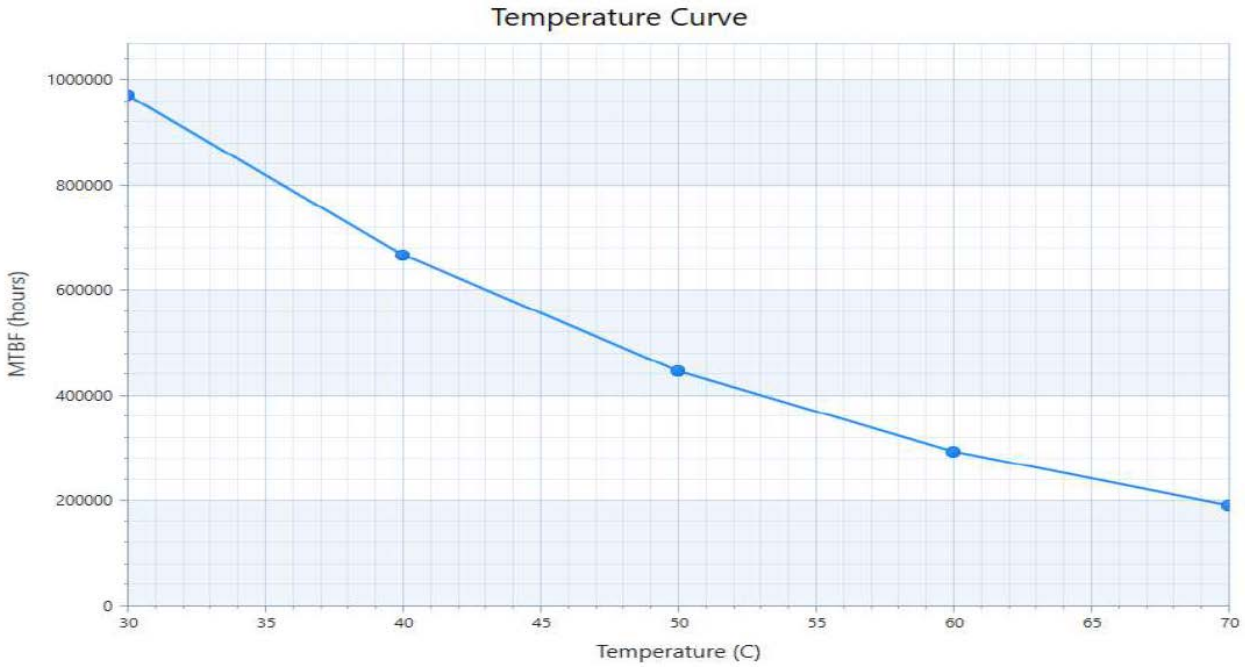
Table 14: MTBF

MTBF
System MTBF (hour) = 669001 h @ 40°C for COMe-bV26 E1 temperature range Reliability report article number: 38036-0000-30-6

The MTBF estimated value above assumes no fan, but a passive heat sinking arrangement. Estimated RTC battery life (as opposed to battery failures) is not accounted for and needs to be considered separately. Battery life depends on both temperature and operating conditions. When the module is connected to external power, the only battery drain is from leakage paths.

Figure 6 shows MTBF de-rating values for commercial grade module variant when used in an office or telecommunications environment. Other environmental stresses (extreme altitude, vibration, salt-water exposure, etc.) lower MTBF values.

Figure 6: MTBF De-rating Values



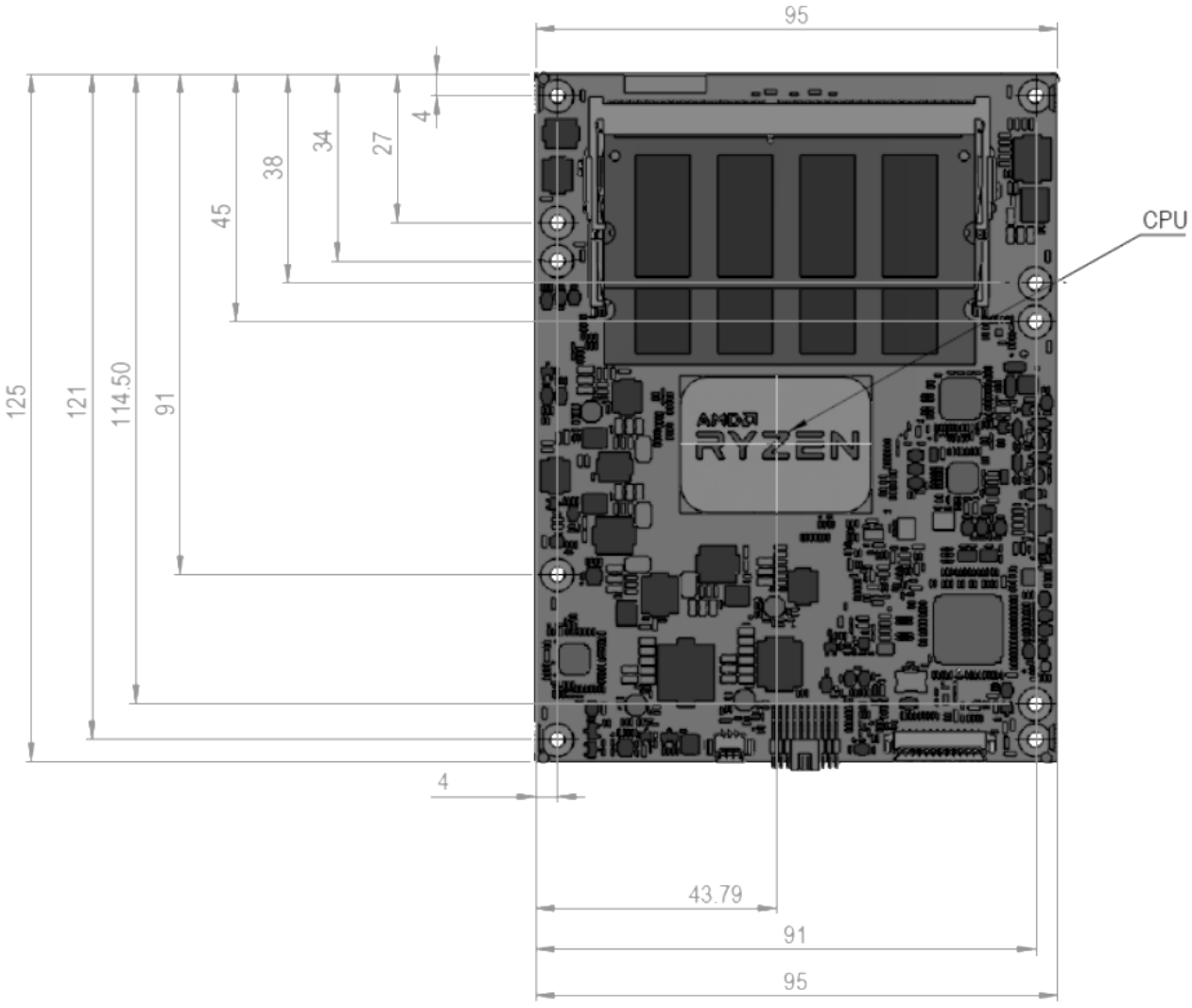
2.8. Mechanical Specification

The COMe-bV26 is compliant with the COM Express® PICMG COM.0 Rev 3.0, mechanical specification.

2.8.1. Module Dimensions

The COMe basic module dimensions are 95 mm x 125 mm (3.7“x 4.9“).

Figure 7: Module Dimensions



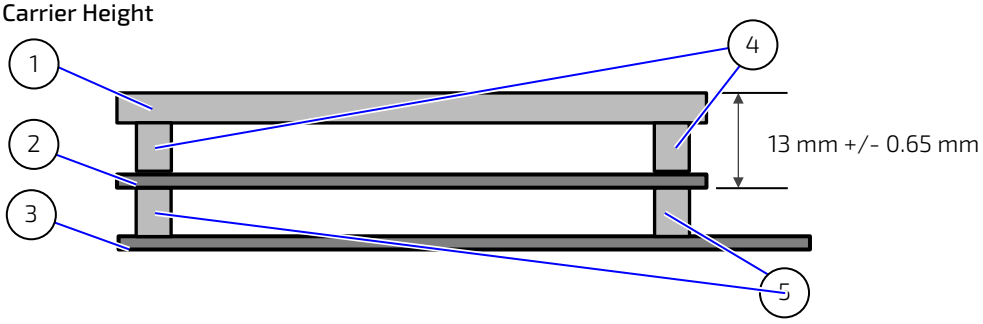
All dimensions are in mm.

2.8.2. Module Height

The COM Express® specification defines a module height of approximately 13 mm, when measured from the bottom of the module’s PCB board, to the top of the heatspreader, see Figure 8: Module and Carrier Height.

The overall height of the module and carrier board depends on the implemented cooling solution. The height of the cooling solution is not specified in the COMe specification.

Figure 8: Module and Carrier Height

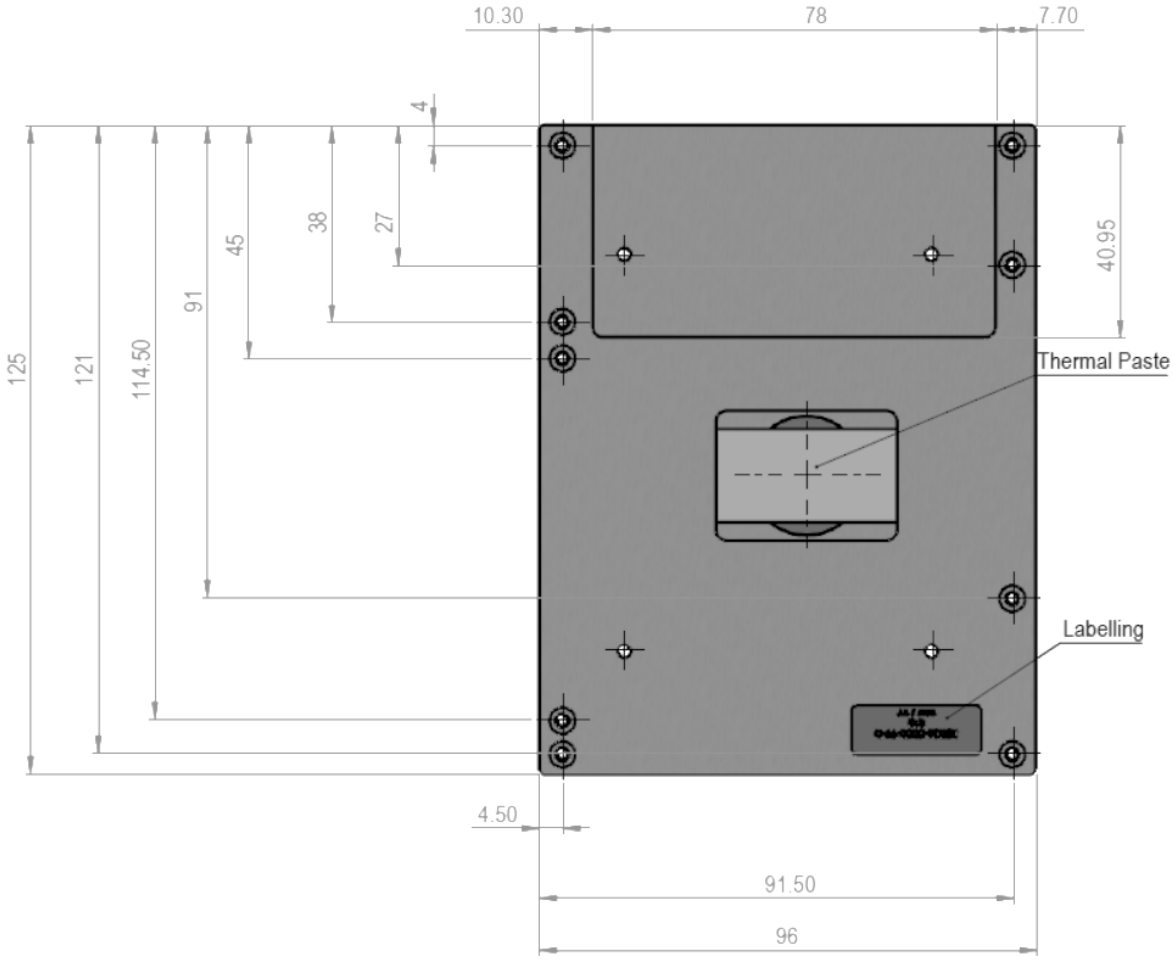


1	Heatspreader	4	Heatspreader standoff(s)
2	Module PCB board	5	Connector standoff(s) 5 mm or 8 mm
3	Carrier PCB board	6	13 mm +/- 0.65 mm

2.8.3. Cooling Concept Dimensions

Thermal paste is used to enhance heat transfer away from the APU.

Figure 9: Cooling Concept Dimensions



All dimensions are in mm.

3/ Features and Interfaces

3.1. ACPI Power States

ACPI enables the system to power down and save power when not required (suspend) and wake up when required (resume). The ACPI controls the power states S0-S5, where S0 has the highest priority and S5 the lowest priority.

The COMe-bV26 supports the ACPI 6.0 power states S0, S3, S4 and S5 only.

Not all ACPI defined power states are available.
Systems that support the low-power idle state do not use power states S1.

Table 15: Supported Power States Function

S0	Working state
S3	Suspend to RAM state
S4	Suspend-to-disk/Hibernate
S5	Soft-off state

To power on from states S3, S4 and S5 use:

- Power Button
- WakeOnLAN (S3, S4)

The OS must support wake up from a USB devices and the carrier board must power the USB port with the standby voltage.

3.2. Fast I2C

The internal I2C bus transfer between components on the same module and the external I2C bus transfers between I2C devices connected on the bus. The fast I2C bus transfers data with transfer rates up to 400 kHz.

To change the I2C bus speed, in the BIOS setup menu select:

Advanced>Miscellaneous>I2C Speed> 400 kHz to 1 kHz

The default speed is 200 kHz.

3.3. GPIO

The eight GPIO pins support four inputs pins (A54 for GPI0, 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).

3.4. Hardware Monitor (HWM)

The Nuvoton NCT7802Y Hardware Monitor (HWM) controls the health of the system by monitoring critical aspects such as the module's processor temperature using thermal resistors, power supply voltages and fan speed for cooling.

The SMART FAN ™ technology controls the duty cycle of the fan output (FAN_PWMOUT) with temperature setting points. This enables flexible fan control for cooling solutions and noise sensitive solutions. For system protection, users can set threshold values for alarm signals.

The HWM is accessible using the SM Bus address 5Ch, see Chapter 4.2: System Management (SM) Bus.

3.5. LPC

The LPC COMe connectors signal are used for external LPC on the carrier board on the carrier board.

3.6. NVMe SSD Flash memory (Option)

The NVMe SSD Flash memory option supports up to 1 TByte of on-board Flash memory.

3.7. Real Time Clock

The RTC keeps track of the current time accurately. The RTC's low power consumption enables the RTC to continue operation and keep time using a lower secondary source of power while the primary source of power is switched off or unavailable.

Typical RTC values are 3 V and less than 10 µA. When powered by <mains power supply, the RTC voltage is generated by on-module regulators, to reduce RTC current draw. The RTC's battery voltage range is 2.8 V to 3.47 V.

The RTC battery input may be left open on the carrier board if an application does not require the RTC to keep time when the main power source is off or unavailable.

3.8. Serial Peripheral Interface

The Serial Peripheral Interface (SPI) bus is a synchronous serial data link where 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.

The SPI interface may only be used with a SPI Flash device to boot from the external BIOS on the carrier board.

3.8.1. SPI Boot

The SPI Flash device stores the BIOS to be booted. The COMe-bV26 supports a 16 MByte (128 Mbit) on-module and carrier board SPI Flash devices. Optionally, a second on-module SPI can be implemented for additional safety.

The pins A34 (BIOS_DIS0#) and pin B88 (BIOS_DIS1#) configure the SPI Flash device to be used, see Table 15.

Table 16: SPI Boot Pin Configuration

BIOS_DIS0#	BIOS_DIS1#	Boot Bus	Function
Open	Open	SPI	Boot on on-module SPI
Open	GND	SPI	Boot on carrier board SPI

The BIOS cannot be split between two chips. Booting takes place either from the module SPI Flash chip or from the carrier board SPI Flash chip.

Table 17: Supported SPI Boot Flash Types

Size	Manufacturer	Part Number	Package Type	Device ID
16 MByte	Winbond	W25Q128JVSIM	SOIC-8 208-mil	7018h / 17h

For additional safety, a second SPI flash can be populated on the module as an option, see Figure 3: Block Diagram COMe-bV26. For more information, contact Kontron Support.

3.8.2. Booting the SPI Flash Chip

Initially, the EFI Shell is booted with an USB key containing the binary used to flash the on-module SPI Flash chip. To program the external SPI Flash chip on the carrier board with the BIOS binary, use an external programmer.

Register for Kontron's Customer Section to get access to BIOS downloads and PCN service.

To boot either the carrier board or on-module SPI flash chip, perform the following:

1. Connect a SPI flash with the correct size (similar to BIOS binary (*.BIN) file size) to the carrier SPI interface.

The external SPI flash chip on the carrier is required to be 16MByte (128 MBit).

2. Open pin A34 (BIOS_DIS0#) and connect pin B88 (BIOS_DIS1#) to ground to enable the external SPI Flash chip to boot on carrier SPI or ground pin A34 (BIOS_DIS0#), and open pin B88 (BIOS_DIS1#) to enable SPI Flash chip to boot on-module SPI.

The command line is AfuEfix64 bV26RXXX.BIN /p /b /n /k /x /l command line.

In case of change, check Kontron's Customer Section for the latest BIOS binary package with reference command line.00

3.9. TPM 2.0

The Trusted Platform Module (TPM) 2.0 technology stores RSA encryption keys specific to the host system for hardware authentication

Each TPM contains an RSA key pair called the Endorsement Key (EK). The pair is maintained inside the TPM 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 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.

The TPM is support via a hardware chip on the module or via firmware. The TPM method of use is selected the BIOS setup menu.

3.10. UART

The UART option supports the serial communications interface up to two serial RX/TX ports defined in the COMe specification on pins A98 (SER0_TX) and A99 (SER0_RX) for UART0, and pins A101 (SER1_TX) and A102 (SER1_RX) for UART1.

The UART option is 16550 compatible and features:

- 64-byte TX /RX host controller FIFOs
- On-chip bit rate (baud rate) generator
- Prioritized interrupt identification
- Programmable FIFO enable/disable

Console redirection will not work if UART legacy option sets to legacy address (0x2E8, 0x2F8, 0x3E8, 0x3F8).

3.11. Watchdog Timer (WTD) Dual Stage

The watchdog timer interrupt is a hardware or software timer implemented by the module to the carrier board if there is a fault condition in the main program; the watchdog triggers a system reset or other corrective actions after a specific time, with the aim to bring the system back from a non-responsive to normal state.

The COMe-bV26 supports an independently programmable watchdog that works with two stages that can used stage by stage.

Table 18: Dual Staged Watchdog Timer- Time-Out Events

0000b	No action	Stage is off and will be skipped
0001b	Reset	Restarts the module and starts a new POST and operating system
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	Triggers WDT pin on the carrier board connector (COM Express® pin B27) only
1001b	Reset + WDT	
1101b	DELAY + WDT -> No action	

3.11.1. Watchdog Timer Signal

The watchdog interrupt (WDT) on COM Express® pin B27 on COM Express® connector indicates a Watchdog time-out event has not been triggered within a set time. The WDT signal is configurable to any of the two stages. After reset, the signal is automatically de-asserted. If de-assertion is necessary during runtime, contact Kontron Support for further help.

4/ System Resources

4.1. I2C Bus

The following table specifies the devices connected to the accessible I2C bus including the I2C address. The I2C bus is available at the COM Express® connector pin A83, I2C_CK and pin A84, I2C_DAT.

Table 19: I2C Bus Port Address

8-bit Address	7-bit Address	Used For	Available
58h	2Ch	Internally reserved	No
A0h	50h	Module embedded EEPROM (Eeep)	Yes
AEh	57h	Carrier board EEPROM	Option
64h	32h	External RTC	Option

4.2. System Management (SM) Bus

The 8-bit SMBus address uses the LSB (bit 0) for the direction of the device.

- Bit0 = 0 defines the write address
- Bit0 = 1 defines the read address

The following table specifies the 8-bit and 7-bit SMBus write address for all devices.

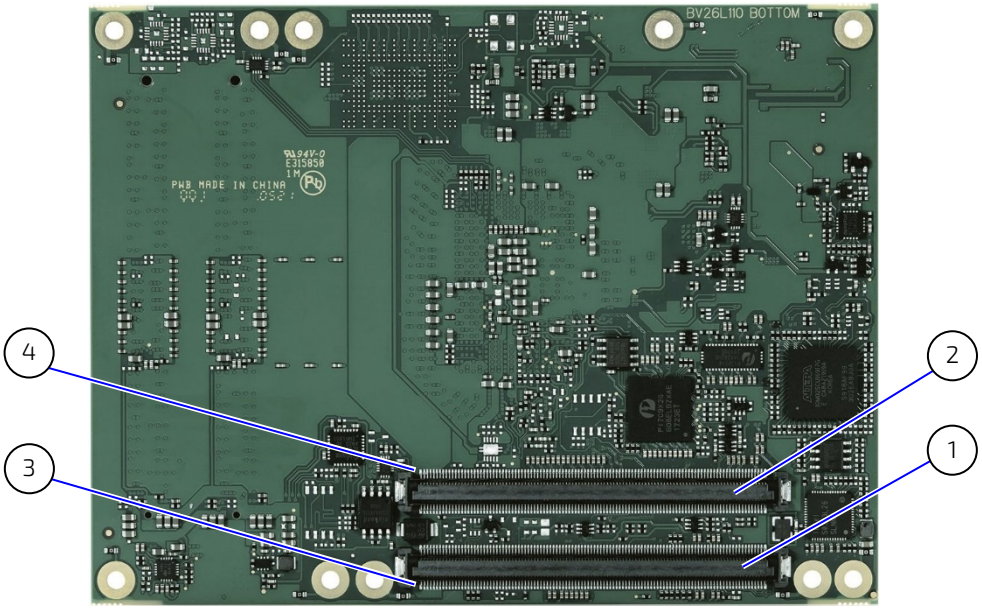
Table 20: SMBus Address

8-bit Address	7-bit Address	Device	Description
5Ch	2Eh	Hardware Monitor NCT7802Y	Do not use this address for external devices under any circumstances!

5/ COMe Interface Connector

The COMe-bV26 is a COM Express® basic module containing two 220-pin connectors X1A and X1B; each with two rows called row A & B on the primary connector X1A and row C & D on the secondary connector X1B.

Figure 10: COM-bV26 Bottom Side



1	COMe interface connector (X1A)	3	Pin X1A, PinA1
2	COMe Interface connector (X1B)	4	Pin X1B, Pin D1

5.1. Connecting COMe Interface Connector to Carrier Board

The COMe interface connectors (X1A, X1B) insert into the corresponding connectors on the carrier board and then secured using the mounting points and standoffs. The height of the standoffs (either 5 mm or 8 mm) depends on the height of the carrier board's connector.

⚠CAUTION

The module is powered on by connecting to the carrier board using the interface connector. Before connecting the module's interface connector to the carrier board's corresponding connector, ensure that the carrier board is switch off and disconnected from the main power supply. Failure to disconnect the main power supply could result in personal injury and damage to the module and/or carrier board.

Observe that only trained personnel aware of the associated dangers connect the module, within an access controlled ESD-safe workplace.

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/EN 62368.

5.2. X1A and X1B Signals

For a description of the terms used in the X1A and X1B pin assignment tables, see Table 21: General Signal Description. If a more detailed pin assignment description is required, refer to the PICMG COM.0 Rev. 3.0 Type 6 standard.

The information provided under type, module terminations and comments is complimentary to the COM.0 Rev 2.1 Type 6 standard. For more information, contact Kontron Support.

Table 21: 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 Differentiator

5.3. COMe Interface Connector (X1A) Pin Assignment

The following tables list the pin assignment of the 220-pin connector X1A (A1 to A110) and (Row B1 to B110) and connector X1B (C1 to C110) and (Row D1 to D110).

5.4. Connector X1A Row A1 - A110

Table 22: Connector X1A Row A1 to A110 Pin Assignment

Pin	Signal	Description	Type	Termination	Comment
A1	GND_A1	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_A11	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	REF	---	100nF capacitor to GND
A15	SUS_S3#	Suspend To RAM (or deeper) Indicator	O-3.3	PD 10K	---
A16	SATA0_TX+	SATA Transmit Pair 0 +	DP-O	AC Coupled on Module	---
A17	SATA0_TX-	SATA Transmit Pair 0 -	DP-O	AC Coupled on Module	---
A18	SUS_S4#	Suspend To Disk (or deeper) Indicator	O-3.3	PD 10K	---
A19	SATA0_RX+	SATA Receive Pair 0 +	DP-I	AC Coupled on Module	---
A20	SATA0_RX-	SATA Receive Pair 0 -	DP-I	AC Coupled on Module	---
A21	GND_A21	Power Ground	PWR GND	---	---
A22	SATA2_TX+	SATA Transmit Pair 2 +	DP-O	---	---
A23	SATA2_TX-	SATA Transmit Pair 2 -	DP-O	---	---
A24	SUS_S5#	Soft Off Indicator	O-3.3	PD 10K	---
A25	SATA2_RX+	SATA Receive Pair 2 +	DP-I	---	---
A26	SATA2_RX-	SATA Receive Pair 2 -	DP-I	---	---

Pin	Signal	Description	Type	Termination	Comment
A27	BATLOW#	Battery Low	I-3.3	PU 10K 3.3V (S5)	Assertion will prevent wake from S3-S5 state
A28	SATA_ACT#	Serial ATA activity LED	OD-3.3	PU 10k 3.3V (S0)	---
A29	HDA_SYNC	HD Audio Sync	O-3.3	---	
A30	HDA_RST#	HD Audio Reset	O-3.3	---	
A31	GND_A31	Power Ground	PWR GND	---	---
A32	HDA_BITCLK	HD Audio Bit Clock Output	O-3.3	---	---
A33	HDA_SDOUT	HD Audio Serial Data Out	O-3.3	---	---
A34	BIOS_DIS0#/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	Integrated PD 14.25K to 24.8K	-
A37	USB6+	USB 2.0 Data Pair Port 6 +	DP-I/O	Integrated 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	Integrated PD 14.25K to 24.8K	---
A40	USB4+	USB 2.0 Data Pair Port 4 +	DP-I/O	Integrated PD 14.25K to 24.8K	---
A41	GND_A41	Power Ground	PWR GND	---	---
A42	USB2-	USB 2.0 Data Pair Port 2 –	DP-I/O	Integrated PD 14.25K to 24.8K	---
A43	USB2+	USB 2.0 Data Pair Port 2 +	DP-I/O	Integrated 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	Integrated PD 14.25K to 24.8K	---
A46	USB0+	USB 2.0 Data Pair Port 0 +	DP-I/O	Integrated PD 14.25K to 24.8K	---
A47	VCC_RTC	Real-Time Clock Circuit Power Input	PWR 3V	---	Voltage range 2.8-3.47V (3.0V Nominal)
A48	RSVD_A48[1]	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	IO3.3-OD	PU 8K2 3.3V (S0)	---
A51	GND_A51	Power Ground	PWR GND	---	---
A52	PCIE_TX5+	PCI Express Lane 5 Transmit +	DP-O	AC Coupled on Module	Only on PCIe_SW Option
A53	PCIE_TX5-	PCI Express Lane 5 Transmit -	DP-O	AC Coupled on Module	Only on PCIe_SW Option

Pin	Signal	Description	Type	Termination	Comment
A54	GPI0	General Purpose Input 0	I-3.3	PU 100K 3.3V (S0)	---
A55	PCIE_TX4+	PCI Express Lane 4 Transmit +	DP-O	AC Coupled on Module	Only on PCIe_SW Option
A56	PCIE_TX4-	PCI Express Lane 4 Transmit -	DP-O	AC Coupled on Module	Only on PCIe_SW Option
A57	GND_A57	Power Ground	PWR GND	---	---
A58	PCIE_TX3+	PCI Express Lane 3 Transmit +	DP-O	AC Coupled on Module	---
A59	PCIE_TX3-	PCI Express Lane 3 Transmit -	DP-O	AC Coupled on Module	---
A60	GND_A60	Power Ground	PWR GND	---	---
A61	PCIE_TX2+	PCI Express Lane 2 Transmit +	DP-O	AC Coupled on Module	---
A62	PCIE_TX2-	PCI Express Lane 2 Transmit -	DP-O	AC Coupled on Module	---
A63	GPI1	General Purpose Input 1	I-3.3	PU 100k 3.3V (S0)	---
A64	PCIE_TX1+	PCI Express Lane 1 Transmit +	DP-O	AC Coupled on Module	---
A65	PCIE_TX1-	PCI Express Lane 1 Transmit -	DP-O	AC Coupled on Module	---
A66	GND_A66	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-O	AC Coupled on Module	---
A69	PCIE_TX0-	PCI Express Lane 0 Transmit -	DP-O	AC Coupled on Module	---
A70	GND_A70	Power Ground	PWR GND	---	---
A71	LVDS_A0+	LVDS Channel A DAT0+ / EDP Lane 2 Transmit +	DP-O	---	---
A72	LVDS_A0-	LVDS Channel A DAT0- / EDP Lane 2 Transmit -	DP-O	---	---
A73	LVDS_A1+	LVDS Channel A DAT1+ / EDP Lane 1 Transmit +	DP-O	---	---
A74	LVDS_A1-	LVDS Channel A DAT1- / EDP Lane 1 Transmit -	DP-O	---	---
A75	LVDS_A2+	LVDS Channel A DAT2+ / EDP Lane 0 Transmit +	DP-O	---	---
A76	LVDS_A2-	LVDS Channel A DAT2- / EDP Lane 0 Transmit -	DP-O	---	---
A77	LVDS_VDD_EN	LVDS / EDP Panel Power Control	O-3.3	PD 100K	---
A78	LVDS_A3+	LVDS Channel A DAT3+	DP-O	---	---
A79	LVDS_A3-	LVDS Channel A DAT3-	DP-O	---	---
A80	GND_A80	Power Ground	PWR GND	---	---
A81	LVDS_A_CK+	LVDS Channel A Clock+ / EDP Lane 3 Transmit +	DP-O	---	Clock: 20-80MHz

Pin	Signal	Description	Type	Termination	Comment
A82	LVDS_A_CK-	LVDS Channel A Clock- / EDP Lane 3 Transmit -	DP-O	---	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_A86[1]	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-O	---	100MHz
A89	PCIE_CLK_REF-	Reference PCI Express Clock -	DP-O	---	100MHz
A90	GND_A90	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 10K 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 10K 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_A104	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
A105	VCC_12V_A105	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
A106	VCC_12V_A106	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---

Pin	Signal	Description	Type	Termination	Comment
A107	VCC_12V_A107	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
A108	VCC_12V_A108	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
A109	VCC_12V_A109	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
A110	GND_A110	Power Ground	PWR GND	---	---

[1] Do not tie the RSVD pins together.

5.5. Connector X1A Row B1 - B110

Table 23: Connector X1A Row B1 to B110 Pin Assignment

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	O-3.3	---	---
B4	LPC_AD0/ ESPI_IO_0	LPC Multiplexed Command, Address & Data 0 / eSPI Master Data I/O 0	I/O-3.3	PU (S0) SKU	---
B5	LPC_AD1/ ESPI_IO_1	LPC Multiplexed Command, Address & Data 1 / eSPI Master Data I/O 1	I/O-3.3	PU (S0) SKU	---
B6	LPC_AD2/ ESPI_IO_2	LPC Multiplexed Command, Address & Data 2 / eSPI Master Data I/O 2	I/O-3.3	PU (S0) SKU	---
B7	LPC_AD3/ ESPI_IO_3	LPC Multiplexed Command, Address & Data 3 / eSPI Master Data I/O 3	I/O-3.3	PU (S0) SKU	---
B8	LPC_DRQ0#/ ESPI_ALERT0#	LPC Serial DMA/Master Request 0 / eSPI Alert 0	I-3.3	PU 10k 3.3V (S0)	---
B9	LPC_DRQ1#/ ESPI_ALERT1#	Not connected	NC	---	---
B10	LPC_CLK/ ESPI_CK	24MHz LPC clock	O-3.3	---	33MHz
B11	GND	Power Ground	PWR GND	---	---
B12	PWRBTN#	Power Button	I-3.3	PU 10k 3.3V (S5)	---
B13	SMB_CK	SMBUS Clock	O-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	I-3.3	PU 10k 3.3V (S5)	---
B16	SATA1_TX+	SATA 1 Transmit Pair +	DP-O	---	---
B17	SATA1_TX-	SATA 1 Transmit Pair -	DP-O	---	---
B18	SUS_STAT#/ ESPI_RESET#	Suspend Status / eSPI Reset	O-3.3	PD 10k	---
B19	SATA1_RX+	SATA 1 Receive Pair +	DP-I	---	---
B20	SATA1_RX-	SATA 1 Receive Pair -	DP-I	---	---
B21	GND_B21	Power Ground	PWR GND	---	---
B22	SATA3_TX+	SATA 3 Transmit Pair +	DP-O	---	---
B23	SATA3_TX-	SATA 3 Transmit Pair -	DP-O	---	---
B24	PWR_OK	Power OK	I-3.3	PU 51k1at 3.3V	20V protection circuit implemented on module
B25	SATA3_RX+	SATA 3 Receive Pair +	DP-I	---	---
B26	SATA3_RX-	SATA 3 Receive Pair -	DP-I	---	---

Pin	Signal	Description	Type	Termination	Comment
B27	WDT	Watchdog Time-Out event	O-3.3	PD 10K	---
B28	HDA_SDIN2	Not Connected	NC	---	---
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_B31	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_B41	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_PRSNT	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_B51	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
B54	GPO1	General Purpose Output 1	O-3.3	PD 100k	---
B55	PCIE_RX4+	PCI Express Lane 4 Receive +	DP-I	---	Only on PCIe_SW Option
B56	PCIE_RX4-	PCI Express Lane 4 Receive -	DP-I	---	Only on PCIe_SW Option

Pin	Signal	Description	Type	Termination	Comment
B57	GPO2	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_B60	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	GPO3	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_B70	Power Ground	PWR GND	---	---
B71	LVDS_B0+	LVDS Channel B DAT0+	DP-O	---	---
B72	LVDS_B0-	LVDS Channel B DAT0-	DP-O	---	---
B73	LVDS_B1+	LVDS Channel B DAT1+	DP-O	---	---
B74	LVDS_B1-	LVDS Channel B DAT1-	DP-O	---	---
B75	LVDS_B2+	LVDS Channel B DAT2+	DP-O	---	---
B76	LVDS_B2-	LVDS Channel B DAT2-	DP-O	---	---
B77	LVDS_B3+	LVDS Channel B DAT3+	DP-O	---	---
B78	LVDS_B3-	LVDS Channel B DAT3-	DP-O	---	---
B79	LVDS_BKLT_EN	LVDS / EDP Panel Backlight On	O-3.3	PD 100k	---
B80	GND_B80	Power Ground	PWR GND	---	---
B81	LVDS_B_CK+	LVDS Channel B Clock+	DP-O	---	20-80MHz
B82	LVDS_B_CK-	LVDS Channel B Clock-	DP-O	---	20-80MHz
B83	LVDS_BKLT_CTRL	LVDS / EDP Backlight Brightness Control	O-3.3	---	---
B84	VCC_5V_SBY_B84	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)
B85	VCC_5V_SBY_B85	5V Standby	PWR 5V (S5)	---	optional (not necessary in single supply mode)
B86	VCC_5V_SBY_B86	5V Standby	PWR 5V (S5)	---	optional (not neccessary in single supply mode)
B87	VCC_5V_SBY_B87	5V Standby	PWR 5V (S5)	---	optional (not neccessary 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_B90	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
B91	VGA_GRN	Analog Video RGB-GREEN	OA	PD 150R	Only on VGA Option
B92	VGA_BLU	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_CK	Display Data Channel Clock	I/O-5	PU 4k75 3.3V (S0)	Only on VGA Option
B96	VGA_I2C_DAT	Display Data Channel Data	I/O-5	PU 4k75 3.3V(S0)	Only on VGA Option
B97	SPI_CS#	SPI Chip Select	O-3.3	---	---
B98	RSVD_B98[1]	Reserved for future use	NC	---	---
B99	RSVD_B99[1]	Reserved for future use	NC	---	---
B100	GND_B100	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_B104	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B105	VCC_12V_B105	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B106	VCC_12V_B106	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B107	VCC_12V_B107	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B108	VCC_12V_B108	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B109	VCC_12V_B109	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
B110	GND_B110	Power Ground	PWR GND	---	---

[1] Do not tie the RSVD pins together.

5.6. Connector X1B Row C1 - C110

Table 24: Connectors X1B Row C1 to C110

Pin	Signal	Description	Type	Termination	Comment
C1	GND_C1	Power Ground	PWR GND	---	---
C2	GND_C2	Power Ground	PWR GND	---	---
C3	USB_SSRX0-	USB Super Speed Receive 0-	DP-I/O	---	
C4	USB_SSRX0+	USB Super Speed Receive 0+	DP-I/O	---	
C5	GND_C5	Power Ground	PWR GND	---	---
C6	USB_SSRX1-	USB Super Speed Receive 1-	DP-I/O	---	
C7	USB_SSRX1+	USB Super Speed Receive 1+	DP-I/O	---	
C8	GND_C8	Power Ground	PWR GND	---	---
C9	USB_SSRX2-	USB Super Speed Receive 2-	DP-I/O	---	
C10	USB_SSRX2+	USB Super Speed Receive 2+	DP-I/O	---	
C11	GND_C11	Power Ground	PWR GND	---	---
C12	USB_SSRX3-	USB Super Speed Receive 3-	DP-I/O	---	
C13	USB_SSRX3+	USB Super Speed Receive 3+	DP-I/O	---	
C14	GND_C14	Power Ground	PWR GND	---	---
C15	DDI1_PAIR6+	Digital Display Interface Pair 6+	NC	---	---
C16	DDI1_PAIR6-	Digital Display Interface Pair 6-	NC	---	---
C17	RSVD_C17	Reserve for future use	NC	---	---
C18	RSVD_C18	Reserve for future use	NC	---	---
C19	PCIE_RX6+	PCI Express Lane 6 Receive +	DP-I	---	Only on PCIe_SW Option
C20	PCIE_RX6-	PCI Express Lane 6 Receive -	DP-I	---	Only on PCIe_SW Option
C21	GND_C21	Power Ground	PWR GND	---	---
C22	PCIE_RX7+	PCI Express Lane 7 Receive +	DP-I		Only on PCIe_SW Option
C23	PCIE_RX7-	PCI Express Lane 7 Receive +	DP-I		Only on PCIe_SW Option
C24	DDI1_HPD	DDI1 Hotplug Detect	I-3.3	PD 1M	---
C25	DDI1_PAIR4 +	Digital Display Interface Pair 4+	NC	---	
C26	DDI1_PAIR4 -	Digital Display Interface Pair 4-	NC	---	
C27	RSVD_C27	Reserve for future use	NC	---	---
C28	RSVD_C28	Reserve for future use	NC	---	---
C29	DDI1_PAIR5+	Digital Display Interface Pair 5+	NC	---	---
C30	DDI1_PAIR5-	Digital Display Interface Pair 5-	NC	---	---
C31	GND_C31	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
C32	DDI2_CTRLCLK_AUX+	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_SEL	DDI2 DDC/AUX select	I-3.3	PD 1M	---
C35	RSVD_C35	Reserved for future use	NC	---	---
C36	DDI3_CTRLCLK_AUX+	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_SEL	DDI3 DDC/AUX select	I-3.3	PD 1M	---
C39	DDI3_PAIR0+	Digital Display Interface Pair 3+	DP-O	---	---
C40	DDI3_PAIR0-	Digital Display Interface Pair 3-	DP-O	---	---
C41	GND_C41	Power Ground	PWR GND	---	---
C42	DDI3_PAIR1+	Digital Display Interface Pair 1+	DP-O	---	---
C43	DDI3_PAIR1-	Digital Display Interface Pair 1-	DP-O	---	---
C44	DDI3_HPD	DDI3 Hotplug Detect	I-3.3	PD 100K	---
C45	RSVD_C45[1]	Reserve for future use	NC	---	---
C46	DDI3_PAIR2+	Digital Display Interface Pair 2+	DP-O	---	---
C47	DDI3_PAIR2-	Digital Display Interface Pair 2-	DP-O	---	---
C48	RSVD_C48[1]	Reserve for future use	NC	---	---
C49	DDI3_PAIR3+	Digital Display Interface Pair 3+	DP-O	---	---
C50	DDI3_PAIR3-	Digital Display Interface Pair 3-	DP-O	---	---
C51	GND_C51	Power Ground	PWR GND	---	---
C52	PEG_RX0+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C53	PEG_RX0-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C54	TYPE0#	The TYPE pins indicate to the Carrier Board the Pin-out Type that is implemented on the module	NC	---	---
C55	PEG_RX1+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C56	PEG_RX1-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C57	TYPE1#	The TYPE pins indicate to the Carrier Board the Pin-out Type that is implemented on the module	NC	---	---
C58	PEG_RX2+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C59	PEG_RX2-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C60	GND_C60	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
C61	PEG_RX3+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C62	PEG_RX3-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C63	RSVD_C63[1]	Reserve for future use	NC	---	---
C64	RSVD_C64[1]	Reserve for future use	NC	---	---
C65	PEG_RX4+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C66	PEG_RX4-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C67	RAPID_SHUTDOWN	Trigger for Rapid Shutdown	NC	---	---
C68	PEG_RX5+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C69	PEG_RX5-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C70	GND_C70	Power Ground	PWR GND	---	---
C71	PEG_RX6+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C72	PEG_RX6-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C73	GND_C73	Power Ground	PWR GND	---	---
C74	PEG_RX7+	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C75	PEG_RX7-	PCI Express Graphics Receive Input differential pairs	DP-I	---	---
C76	GND_C76	Power Ground	PWR GND	---	---
C77	RSVD_C77[1]	Reserve for future use	NC	---	---
C78	PEG_RX8+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C79	PEG_RX8-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C80	GND_C80	Power Ground	PWR GND	---	---
C81	PEG_RX9+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C82	PEG_RX9-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C83	RSVD_C83[1]	Reserve for future use	NC	---	---
C84	GND_C84	Power Ground	PWR GND	---	---
C85	PEG_RX10+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C86	PEG_RX10-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C87	GND_C87	Power Ground	PWR GND	---	---
C88	PEG_RX11+	PCI Express Graphics Receive Input differential pairs	NC	---	---

Pin	Signal	Description	Type	Termination	Comment
C89	PEG_RX11-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C90	GND_C90	Power Ground	PWR GND	---	---
C91	PEG_RX12+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C92	PEG_RX12-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C93	GND_C93	Power Ground	PWR GND	---	---
C94	PEG_RX13+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C95	PEG_RX13-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C96	GND_C96	Power Ground	PWR GND	---	---
C97	RSVD_C97[1]	Reserve for future use	NC	---	---
C98	PEG_RX14+	PCI Express Graphics Receive Input differential pair	NC	---	---
C99	PEG_RX14-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C100	GND_C100	Power Ground	PWR GND	---	---
C101	PEG_RX15+	PCI Express Graphics Receive Input differential pairs	NC	---	---
C102	PEG_RX15-	PCI Express Graphics Receive Input differential pairs	NC	---	---
C103	GND_C103	Power Ground	PWR GND	---	---
C104	VCC_12V_C104	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C105	VCC_12V_C105	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C106	VCC_12V_C106	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C107	VCC_12V_C107	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C108	VCC_12V_C108	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C109	VCC_12V_C109	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
C110	GND_C110	Power Ground	PWR GND	---	---

[1] Do not tie the RSVD pins together.

5.7. Connector X1B Row D1 - D110

Table 25: Connectors X1B Row D1 to D110

Pin	Signal	Description	Type	Termination	Comment
D1	GND_D1	Power Ground	PWR GND	---	---
D2	GND_D2	Power Ground	PWR GND	---	---
D3	USB_SSTX0-	USB Super Speed Transmit 0 -	DP-O	---	
D4	USB_SSTX0+	USB Super Speed Transmit 0 +	DP-O	---	
D5	GND_D5	Power Ground	PWR GND	---	---
D6	USB_SSTX1-	USB Super Speed Transmit 1 -	DP-O	---	
D7	USB_SSTX1+	USB Super Speed Transmit 1 +	DP-O	---	
D8	GND_D8	Power Ground	PWR GND	---	---
D9	USB_SSTX2-	USB Super Speed Transmit 2 -	DP-O	---	
D10	USB_SSTX2+	USB Super Speed Transmit 2 +	DP-O	---	
D11	GND_D11	Power Ground	PWR GND	---	---
D12	USB_SSTX3-	USB Super Speed Transmit 3 -	DP-O	---	
D13	USB_SSTX3+	USB Super Speed Transmit 3 +	DP-O	---	
D14	GND_D14	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_D17[1]	Reserved for future use	NC	---	---
D18	RSVD_D18[1]	Reserved for future use	NC	---	---
D19	PCIE_TX6+	PCIE Express Lane 6 Transmit +	DP-O	AC Coupled on Module	Only on PCIe_SW Option
D20	PCIE_TX6-	PCIE Express Lane 6 Transmit -	DP-O	AC Coupled on Module	Only on PCIe_SW Option
D21	GND_D21	Power Ground	PWR GND	---	---
D22	PCIE_TX7+	PCIE Express Lane 7 Transmit +	DP-O	AC Coupled on Module	Only on PCIe_SW Option
D23	PCIE_TX7-	PCIE Express Lane 7 Transmit -	DP-O	AC Coupled on Module	Only on PCIe_SW Option
D24	RSVD_D24[1]	Reserve for future use	NC	---	---
D25	RSVD_D25[1]	Reserve for future use	NC	---	---
D26	DDI1_PAIR0+	Digital Display Interface Pair 0 +	DP-O	---	---
D27	DDI1_PAIR0-	Digital Display Interface Pair 0 -	DP-O	---	---
D28	RSVD_D28[1]	Reserve for future use	NC	---	---
D29	DDI1_PAIR1+	Digital Display Interface Pair 1 +	DP-O	---	---
D30	DDI1_PAIR1-	Digital Display Interface Pair 1 -	DP-O	---	---
D31	GND_D31	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
D32	DDI1_PAIR2+	Digital Display Interface Pair 2 +	DP-O	---	---
D33	DDI1_PAIR2-	Digital Display Interface Pair 2 -	DP-O	---	---
D34	DDI1_DDC_AUX_SEL	DDI1 DDC/AUX select	I-3.3	PD 1M	---
D35	RSVD_D35[1]	Reserve for future use	NC	---	---
D36	DDI1_PAIR3+	Digital Display Interface Pair 3 +	DP-O	---	---
D37	DDI1_PAIR3-	Digital Display Interface Pair 3 -	DP-O	---	---
D38	RSVD_D38[1]	Reserve for future use	NC	---	---
D39	DDI2_PAIR0+	Digital Display Interface Pair 0 +	DP-O	---	---
D40	DDI2_PAIR0-	Digital Display Interface Pair 0 -	DP-O	---	---
D41	GND_D41	Power Ground	PWR GND	---	---
D42	DDI2_PAIR1+	Digital Display Interface Pair 1 +	DP-O	---	---
D43	DDI2_PAIR1-	Digital Display Interface Pair 1 -	DP-O	---	---
D44	DDI2_HPD	DDI2 Hotplug Detect	I-3.3	PD 100K	---
D45	RSVD_D45[1]	Reserve for future use	NC	---	---
D46	DDI2_PAIR2+	Digital Display Interface Pair 2 +	DP-O	---	---
D47	DDI2_PAIR2-	Digital Display Interface Pair 2 -	DP-O	---	---
D48	RSVD_D48[1]	Reserve for future use	NC	---	---
D49	DDI2_PAIR3+	Digital Display Interface Pair 3 +	DP-O	---	---
D50	DDI2_PAIR3-	Digital Display Interface Pair 3 -	DP-O	---	---
D51	GND_D51	Power Ground	PWR GND	---	---
D52	PEG_TX0+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D53	PEG_TX0-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D54	PEG_LANE_RV#	PCI Express Graphics lane reversal input strap. Pull low on the carrier board to reverse lane order	NC	---	---
D55	PEG_TX1+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D56	PEG_TX1-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D57	TYPE2#	GND for type 6 module	PWR	---	---
D58	PEG_TX2+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D59	PEG_TX2-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D60	GND_D60	Power Ground	PWR GND	---	---
D61	PEG_TX3+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D62	PEG_TX3-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D63	RSVD_D63[1]	Reserve for future use	NC	---	---
D64	RSVD_D64[1]	Reserve for future use	NC	---	---

Pin	Signal	Description	Type	Termination	Comment
D65	PEG_TX4+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D66	PEG_TX4-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D67	GND_D67	Power Ground	PWR GND	---	---
D68	PEG_TX5+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D69	PEG_TX5-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D70	GND_D70	Power Ground	PWR GND	---	---
D71	PEG_TX6+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D72	PEG_TX6-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D73	GND_D73	Power Ground	PWR GND	---	---
D74	PEG_TX7+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D75	PEG_TX7-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	---
D76	GND_D76	Power Ground	PWR GND	---	---
D77	RSVD_D77[1]	Reserve for future use	NC	---	---
D78	PEG_TX8+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D79	PEG_TX8-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D80	GND_D80	Power Ground	PWR GND	---	---
D81	PEG_TX9+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D82	PEG_TX9-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D83	RSVD_D83[1]	Reserved for future use	NC	---	---
D84	GND_D84	Power Ground	PWR GND	---	---
D85	PEG_TX10+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D86	PEG_TX10-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D87	GND_D87	Power Ground	PWR GND	---	---
D88	PEG_TX11+	PCI Express Graphics Transmit Output differential pair	NC	---	---
D89	PEG_TX11-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D90	GND_D90	Power Ground	PWR GND	---	---
D91	PEG_TX12+	PCI Express Graphics Transmit Output differential pairs	NC	---	---

Pin	Signal	Description	Type	Termination	Comment
D92	PEG_TX12-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D93	GND_D93	Power Ground	PWR GND	---	---
D94	PEG_TX13+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D95	PEG_TX13-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D96	GND_D96	Power Ground	PWR GND	---	---
D97	RSVD_D97	SPI Chip Select	NC	---	---
D98	PEG_TX14+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D99	PEG_TX14-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D100	GND_D100	Power Ground	PWR GND	---	---
D101	PEG_TX15+	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D102	PEG_TX15-	PCI Express Graphics Transmit Output differential pairs	NC	---	---
D103	GND_D103	Power Ground	PWR GND	---	---
D104	VCC_12V_D104	Main Input Voltage (8.5-20V)	PWR 8.5-20V	---	---
D105	VCC_12V_D105	Main Input Voltage (8.5-20V)	PWR 8.5-20V PWR	---	---
D106	VCC_12V_D106	Main Input Voltage (8.5-20V)	PWR 8.5-20V PWR	---	---
D107	VCC_12V_D107	Main Input Voltage (8.5-20V)	PWR 8.5-20V PWR	---	---
D108	VCC_12V_D108	Main Input Voltage (8.5-20V)	PWR 8.5-20V PWR	---	---
D109	VCC_12V_D109	Main Input Voltage (8.5-20V)	PWR 8.5-20V PWR	---	---
D110	GND_D110	Power Ground	PWR GND	---	---

[1] Do not tie the RSVD pins together.

6/ UEFI BIOS

6.1. Starting the uEFI BIOS

The COM-bV26 uses a Kontron-customized, pre-installed and configured version of AMI Aptio V BIOS ® based on the Unified Extensible Firmware Interface (uEFI) specification. The uEFI BIOS provides a variety of new and enhanced functions specifically tailored to the hardware features of the COM-bV26.

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

Register for Kontron's 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.

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 <DEL> key.
4. If the uEFI BIOS is password-protected, a request for password will appear. Enter either the User Password or the Supervisor Password (see Chapter 6.4.4: Security Setup Menu), press <RETURN>, and proceed with step 5.
5. A Setup menu appears.

6.2. Navigating the uEFI BIOS

The COM-bV26 uEFI BIOS Setup program uses a hot key navigation system. The hot key legend bar is located at the bottom of the BIOS setup screens. The following table lists the navigation hot keys available in the legend bar.

Table 26: 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

The currently active menu and the currently active uEFI BIOS Setup item are highlighted in white. Use the left and right arrow keys to select the Setup menu.

Each Setup menu provides two main frames. The left frame displays all available functions and configurable functions are displayed in blue. Functions displayed in grey provide information about the status or the operational configuration.

6.3. Getting Help

The right frame displays a help window. The help window provides an explanation of the respective function.

6.4. Setup Menus

The Setup utility features a selection bar at the top of the screen that lists the available Setup menus for the COMe-bV26:

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

Figure 11: Setup menu Selection Bar

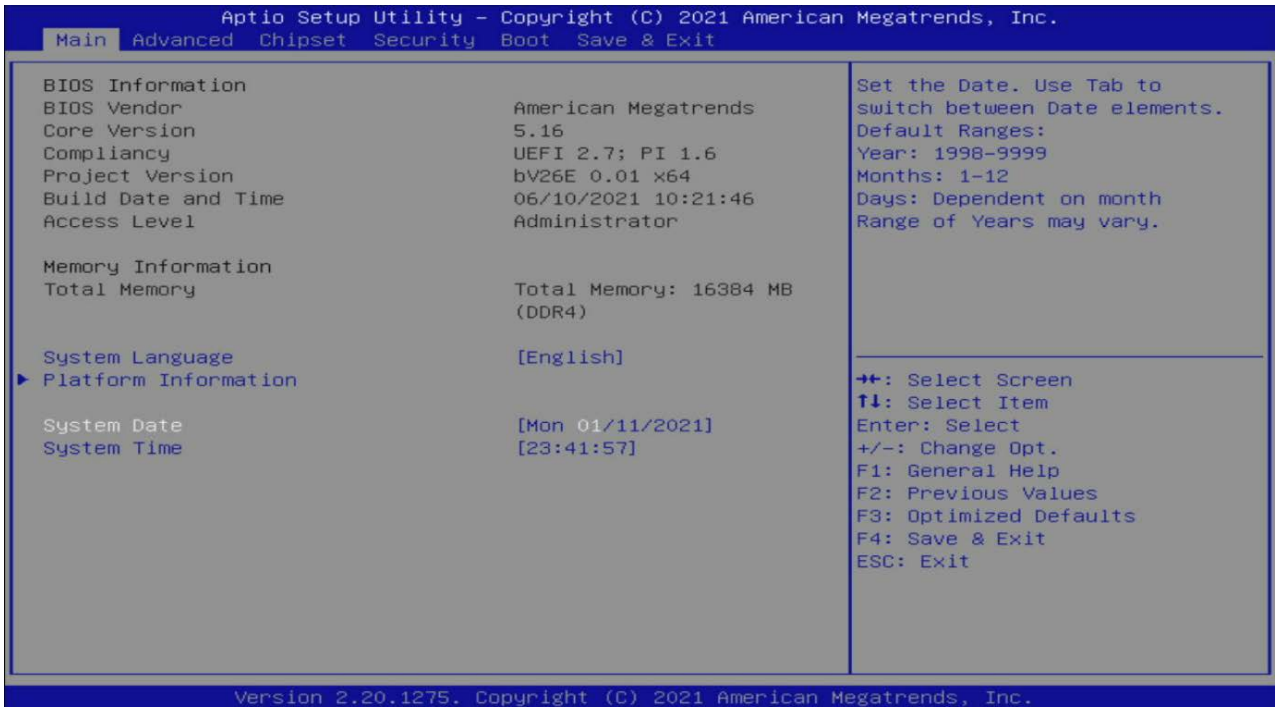
The currently active Setup menu is highlighted in grey. Use the left and right arrow keys to select the Setup menu.

Each Setup menu provides two main frames. The left frame displays all available functions. Configurable functions are displayed in blue and the current function is highlighted in white. Functions displayed in grey provide information about the status or the operational configuration.

6.4.1. Main Setup Menu

The Main setup menu lists sub-screens and second level sub-screens of the functions supported within the Main setup menu.

Figure 12: Main Setup Menu



The following table shows the Main Menu sub-screens and describes the function. Default settings are in **bold**.

Table 27: Main Setup Menu Sub-screens and Functions

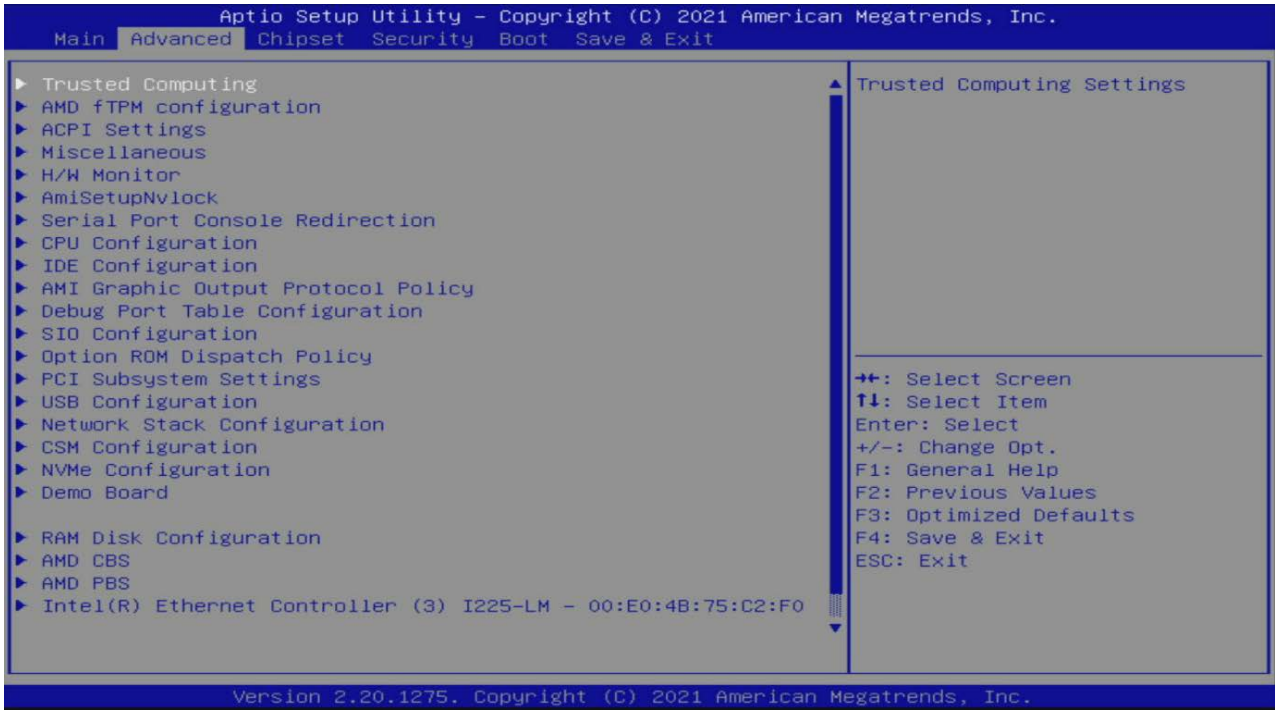
Sub-Screen	Description
BIOS Information	Read only field Displays BIOS Information: BIOS vendor, Core version, Compliancy, Project Version, Build Date and Time and Access level
Memory Information	Read only field Total memory
System Language	[**English**]
Platform Information	Read only field Displays Module Information Product Name, Revision, Configuration, Serial # ,MAC Address, Boot Counter, and CPLD Rev
	Additional information for MAC Address 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 Advanced > Network Stack Configuration > Network Stack > Enable
System Date	Displays the system date [Day mm/dd/yyyy]
System Time	Displays the system time [hh:mm:ss]

6.4.2. Advanced Setup Menu

The Advanced Setup menu lists sub-screens and second level sub-screens of the functions supported within the Advanced setup menu.

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

Figure 13: Advanced Setup Menu



The following table shows the Advanced sub-screen and describes the function. Default settings are in **bold**.

Table 28: Advanced Setup Menu Sub-screens and Functions

Sub-Screen	Function	Second level Sub-Screen/Description
Trusted Computing>	Security Device Support	BIOS support for security devices. OS will not show security device. TCG EFI protocol and INT1A interface will not be available. [**Enable,** Disable]
	SHA-1 PCR Bank	[**Enable**, Disable]
	SHA256 PCR Bank	[**Enable,** Disable]
	Pending Operation	Schedule an operation for the security device. Note: computer will reboot during restart in order to change State of Security device. [**None,** TPM Cle**ar]**
	Platform Hierarchy	[**Enable,** Disable**]**
	Storage Hierarchy	[**Enable,** Disable]
	Endorsement Hierarchy	[**Enable,** Disable**]**

Sub-Screen	Function	Second level Sub-Screen/Description	
Trusted Computing>	TPM 2.0 UEFI Spec Version	Select the TCG2 Spec Version support. [TCG_1_2, **TCG_2**]	
	Physical Presence Spec Version	Select to tell OS to support PPI Spec version 1.2 or 1.3. Note: Some HCK tests might not support 1.3. [1.2, **1.3**]	
	TPM 2.0 Interface Type	[**CRB**]	
AMD fTPM Configuration>	AMD fTPM switch	0: Auto (Depend on Tcg module), 1: Disable fTPM, 2: Onboard SPI TPM 2.0. [**AMD CPU fTPM**, Route to SPI TPM]	
	Erase fTPM NV for factory reset	Select 'Enable' when new processor is installed to rest fTPM. Note: if you have a BitLocker or encryption-enable system, the system will not boot without a recovery key. Select 'Disable' to keep the previous fTPM record and continue to system boot, fTPM will not be enabled with new processor unless fTPM is reset (reinitialized). [**Enable,** Disable]	
ACPI Settings>	Enable ACPI Auto Configuration	[Enable, **Disable**]	
	Enable Hibernation	System ability to hibernate (OS/S4 sleep state). Note: May not be effective with some operating systems. [**Enable,** Disable]	
	ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the suspend button is pressed. [**Suspend Disabled,** S3 Suspend to RAM]	
	Lock Legacy Resources	[Enable, **Disable**]	
Miscellaneous>	Generic LPC Decode Ranges>	Generic LPC Decode 1	[Enable, **Disable**]
	Smart Battery Configuration>	M.A.R.S.	[Disabled, **Auto**, Charger, Manager]
		System Type	Unknown
		Power Source	Unknown
		Connected Batteries	[0]
	Watchdog>	Auto-reload	Enable automatically reloads watchdog timers on timeout. [Enable, **Disable**]
		Global Lock	Enable sets all watchdog registers (except WD-KICK) to read only until the board is reset. [Enable, **Disable**]
		Stage 1 Mode	Selects action for the watchdog stage. [Enable, **Disable**]
	I2C Speed	I2C Bus speed in kHz (Min. 1 KHz, Max. 400 kHz.) 200 kHz is appropriate for a default system. [200]	
	Onboard I2C Mode	[**Multimaster**, Busclear]	
	Lid Switch Mode	Shows or hides sleep button [Enable, **Disable**]	

Sub-Screen	Function	Second level Sub-Screen/Description
Miscellaneous>	Sleep Button Mode	Shows or hides Lid Switch inside ACPI OS. [Enable, **Disable**]
	SMBus Device ACPI Mode	Shows or hides SM Bus device from OS. [Hidden, **Normal**]
	CPLD Device ACPI Mode	Shows or hides CPLD device from OS. [Hidden, N**ormal**]
	Control COMe GPIOs in BIOS	If disabled, the GPIOs are not touched by BIOS. [Enabled, **Disabled**]
	GPIO IRQ#	Sets IRQ number triggered by CPLD on GPIO event. [**Disabled**, IRQ5, IRQ6, IRQ7, IRQ10, IRQ11, IRQ12, IRQ14, IRQ15]
	I2C IRQ#	Sets IRQ number triggered by CPLD on I2C event. [**Disabled**, IRQ5, IRQ6, IRQ7, IRQ10, IRQ11, IRQ12, IRQ14, IRQ15]
H/W Monitor>	HW Monitor NCT7802Y	
	CPU Temperature	[35°C]
	Module Temperature	[31°C]
	CPU Fan	
	Fan Control	Sets fan control mode. Note: disable totally stops fan. [**Auto**, Disabled, Manual]
	Fan Pulse	Number of pulses the fan produces during one revolution. (range 1 to 4) [2]
	Fan Trip Point	Temperature where the fan accelerates (range 20°C to 80°C). [50]
	Trip Point Speed	Fan speed at trip point in %- Minimum value is 30. Fan always runs 100% at TJ max - 10 C [50]
	Reference Temperature	[Module Temperature, **CPU Temperature**]
	External Fan	
	Fan Control	Sets fan control mode Note: disable totally stops fan [**Auto**, Disabled, Manual]
	Fan Pulse	Number of pulses the fan produces during one revolution (range 1 to 4) [2]
	Fan Trip Point	Temperature where the fan accelerates (range 20°C to 80°C) [50]
	Trip Point Speed	Fan speed at trip point in %- Minimum value is 30. Fan always runs 100% at TJ max - 10 C [50]
	Reference Temperature	[**Module Temperature**, CPU Temperature]
	5.0 V Standby	5.01 V
	Batt Volt at COMe pin	2.97 V
	Widerange VCC	12.07 V
AMISetupNvlock>	RunTimeVariable Protection Support	[**Enabled**, Disabled]

Sub-Screen	Function	Second level Sub-Screen/Description
Serial Port Console Redirection>	COM0 (PCI Bus 0, Dev0, Func0, Port0)	
	Console Redirection	[Enabled, **Disabled**]
	Console Redirection Settings	
	COM0 (PCI Bus 0, Dev0, Func0, Port0)	
	Console Redirection	[Enabled, **Disabled**]
	Serial Port for Out-of-Band Management Windows Emergency Management Services (EMS)	
	Console Redirection EMS	[**Enable**, Disable]
CPU Configuration>	Read only Module Version: RenoirCPU 08 AGESA Version: Embedded-FP6 PI 1006	
	PSS Support	The generation of ACPI _PPC, -PSS and _ PCT objects. [**Enabled**, Disabled]
	PCC Adjustment	Provide to adjust _PCC object. [**PState 0**, PState 1, PState 2]
	NX	No-Execute page protection function [**Enabled**, Disabled]
	SVM Mode	CPU Virtualization [**Enabled**, Disabled]
	Node 0 Information	Read only Socket, Core(s) Processor Family, Processor Model, , CPUID, Current Speed, Min Speed , Microcode and Cache per Core.
IDE Configuration>	IDE Configuration	
AMI Graphic Output Protocol Policy>	Read Only Field Renoir AMD GOP x64 Release Driver Rev. 2.13.0.0.0.Jul 13	
	Output Select	Output Interface [**DFP3_DP**]
Debug Port Table Configuration>	Debug Port Table	[Enabled, **Disabled**]
	Debug Port Table 2	[Enabled, **Disabled**]
SIO Configuration>	Read Only Field AMI SIO Driver Version : A5.10.00	
	Super IO Chip Logical Devices(s) Configuration	
	[*Active*] Serial Port 1>	Serial Port 1 Configuration
		User this Device: [**Enabled**, Disabled]
		Logical Device Settings:
		Current: IO=3F8h: IRQ=4
		Possible: [**Use Automatic Settings**, IO=3F8h: IRQ=4: IO=3F8h: IRQ=3,4,5,7,9,10,11,12, IO=2F8h: IRQ=3,4,5,7,9,10,11,12, IO=3E8h: IRQ=3,4,5,7,9,10,11,12,

Sub-Screen	Function	Second level Sub-Screen/Description	
SIO Configuration>	[*Active*] Serial Port 1>		IO=2E8h: IRQ=3,4,5,7,9,10,11,12]
	Warning: Disabling SIO logical devices may have unwanted side effects. PROCEED WITH CAUTION.		
	[*Active*] Serial Port 2>	Serial Port 1 Configuration	
		User this Device	[**Enabled**, Disabled]
		Logical Device Settings:	
		Current	IO=2F8h: IRQ=3
		Possible	[**Use Automatic Settings**, IO=2F8h: IRQ=3: IO=3F8h: IRQ=3,4,5,7,9,10,11,12, IO=2F8h: IRQ=3,4,5,7,9,10,11,12, IO=3E8h: IRQ=3,4,5,7,9,10,11,12, IO=2E8h: IRQ=3,4,5,7,9,10,11,12]
	Warning: Disabling SIO logical devices may have unwanted side effects. PROCEED WITH CAUTION.		
	[Disabled] Serial Port 3	Depends on configuration	
	[Disabled[Serial Port 4	Depends on configuration	
	Warning: Logical devices state on the left side of the control, reflects the current logical device state. Changes made during setup session will be shown after you restart the system.		
Option ROM Dispatch Policy>	Restore if Failure	If system fails to boot and this option is set to enabled, software resets settings of this page as well as CSM page to the default values automatically. [Enabled, **Disabled**]	
	Primary Video Ignore	If software will detect that due to the policy settings, option ROM of Primary Video Device will not dispatch, it ignores this device policy setting and restores it to Enable automatically. [**Enabled,** Disabled]	
	Device Group Default ROM Policy (CSM Not Active)- UEFI used:		
	Device Class Option ROM Dispatch Policy:		
	Slot #32 Empty	ROM execution for selected slot [**Enabled,** Disabled]	
	Slot #33 Empty	ROM execution for selected slot [**Enabled,** Disabled]	
	Slot #50 Empty	ROM execution for selected slot [**Enabled,** Disabled]	
	Slot #51 Empty	ROM execution for selected slot [**Enabled,** Disabled]	
	Warning: Changing device(s) option ROM dispatch policy may affect system's ability to post and/or boot. PROCEED WITH CAUTION!		
PCI Subsystem Settings>	PCI Settings Common for all Devices		
	Above 4G Decoding	64 bit capable devices to be decoded in Above 4G address space (Only if system supports 64 bit PCI decoding. [**Enabled/**Disabled]	

Sub-Screen	Function	Second level Sub-Screen/Description	
PCI Subsystem Settings>	SR-IOV Support	SR-IOV capable devices single root IO virtualization support [Enabled, **Disabled**]	
	BME DMA Mitigation	Re-enables Bus Master Attribute disabled during PCI enumeration for PCI bridges after SMM Locked [Enabled, **Disabled**]	
	Warning: Changing PCI devices(s) settings may have unwanted side effects! System may hang! PROCEED WITH CAUTION.		
USB Configuration>	Legacy USB Support	Auto: disables legacy support if no USB devices connected. Disable: keeps USB devices available only for EFI application. [**Enabled,** Disable, Auto]	
	XHCI Hand-off	Work around for OS(s) without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver. [**Enable**, Disable]	
	USB Mass Storage Driver Support	[**Enable**, Disable]	
	USB Hardware Delays and Time-outs		
	USB Transfer Time-out	Timeout value for control, bulk, and interrupt transfers. [1 sec, 5 sec, 10 sec, **20 sec**]	
	Device Reset Time-out	USB mass storage device start unit command time-out. [10 sec, **20 sec**, 30 sec, 40 sec]	
	Device Power-up Delay	Maximum time device takes to report to Host controller. Auto used default value for a root port (100 ms). For a HIB port the delay is taken from Hub descriptor. [**Auto**, Manual]	
	Mass Storage Devices		
	Pi-KVM CD-ROM Drive 0510	Auto: enumerates devices according to their media format. Optical drives are emulated as CD-ROM drives. Drives with no media will be emulated according to drive type. [**Auto**, Floppy, Forced FDD, Hard Disk, CDRom]	
Network Stack Configuration>	Network Stack	[Enabled, **Disabled**]	
CSM Configuration	CSM Support		
NVMe Configuration	Depends on configuration		
Demo Board>	Onboard PCIE LAN PXE ROM	[**Enabled**, Disabled]	
	PCI-E Port>	PCI-E Port Control	Skip page set up and use default CRB settings [**Enabled**, Disabled]
		Device (*) Fun (*)	[Enabled, Disabled, **Auto**]
		ASPM Mode Dev# (*) / Func# (*)	NB Root port ASPM mode control [Disabled, L0s Entry, L1 Entry, L0s and L1 Entry, **Auto**]

Sub-Screen	Function	Second level Sub-Screen/Description		
Demo Board>	PCI-E Port>	Hotplug Mode Dev# (*)/ Fun# (*)	NB Root port Hotplug mode control [Disabled, Hotplug Basic, Hotplug Server, Hotplug Enhanced, Hotplug Inboard, **Auto**]	
AMD CBS>	CPU Common Options>	Performance>	Custom Core PStates	
		Warning: Damage caused by use of your AMD Processor outside of specification or in excess of factory settings are not covered under your AMD product warranty and may not be covered by system manufacturer's warranty.		
		Prefetch Settings>	L1 Stream HW Prefetcher	[Enabled, Disabled, **Auto**]
			L2 Stream HW Prefetcher	[Enabled, Disabled, **Auto**]
		Core Watchdog>	Core Watchdog Timer Enable	[Enabled, Disabled, **Auto**]
		Redirect For ReturnDis	[**Auto**, 1, 0]	
		Platform First Error Handling	PFEH, Cloak individual banks and mask deferred error interrupts from each bank. [Enabled, Disabled, **Auto**]	
		Core Performance Boost	Disable CP8 [Disabled, **Auto**]	
		Global C-State Control	Controls the IO based C-State generation and DF C-States. Note: there is another C-State option which synchronizes with this option if DF C-State option is Auto. [Enabled, Disabled, **Auto**]	
		Opcache Control	[Enabled, Disabled, **Auto**]	
		SEV ASID Count	Specifies the max. valid ASID that affects the max. system physical address space [253 ASIDs, 509 ASIDs, **Auto**]	
		SEV-ES ASID Space Limit Control	[Manual, **Auto**]	
		Streaming Stores Control	Streaming Stores functionality [Enabled, Disabled, **Auto**]	
		Local ACIP Mode	[xAPIC, x2APIC, **Auto**]	
		ACIP_CST C1 Declaration	Determines whether or not to declare the C1 state to the OS [Enabled, Disabled, **Auto**]	
		MCA Error Thresh Enable	Enable MCA error threshold. [False, **True**]	
		MCA Error Thresh Count	The default value of 0xFF5 results in a threshold of 10. [ff5]	

Sub-Screen	Function	Second level Sub-Screen/Description		
AMD CBS>	CPU Common Options>	SMU and PSP Debug Mode	Specific uncorrected errors detected by the PSP FW or SMU FW will hang and not reset the system. [Enabled, Disabled, **Auto**]	
		PPIN Opt-IN	Turn on PPIN Feature. [Enabled, Disabled, **Auto**]	
	DF Common Options>	Scrubber>	DRAM Scrub Time	[Disabled, 1hr, 4 hr, 8 hr, 16 hr, 24 hr, 48 hr, **Auto**]
			Poison Scrubber Control	[Enabled, Disabled, **Auto**]
			Redirect Scrubber Control	[Enabled, Disabled, **Auto**]
			Redirect Scrubber Limit	[2, 4, 8, infinite, **Auto**]
		Memory Addressing>	Memory Interleaving	[Disabled, **Auto**]
			Memory Interleaving Size	The size determines the starting address of the interleave [256 Bytes, 512 Bytes, 1 kB, 2kB, **Auto**]
			DRAM Map Inversion	Inverting causes the highest memory channels to get assigned the lowest system addresses [Enabled, Disabled, **Auto**]
		CC6 Memory Region Encryption	Controls is CC6 save/restore memory is encrypted. [Enabled, Disabled, **Auto**]	
		Memory Clear	When disabled BIOS does not implement Mem Clear after memory training (only if Non-ECC DIMMs are used). [Enabled, Disabled, **Auto**]	
		Disable DF to External Downstream IP Sync Flood Propagation	Disables error propagation to UMC or any downstream slaves e.g. FCH. Use this to avoid reset in failure scenario. [Sync flood enabled, Sync flood disabled, **Auto**]	
		Disable DF Sync Flood Propagation	Disables propagation from PIE to other DF components and eventually to SDP ports. [Sync flood enabled, Sync flood disabled, **Auto**]	
		Freeze DF Module Queues on Error	Enable freezes all DF queues on error and also forces a sync flood on HWA even if MCAs are disabled. [Enabled, Disabled, **Auto**]	

Sub-Screen	Function	Second level Sub-Screen/Description		
AMD CBS>	DF Common Options>	DF C-States	Enable: FW programs registers required to enable feature. [Enabled, Disabled, **Auto**]	
	UMC Common Options>	DDR4 Common Options>	DRAM Timing Configuration	
			Warning: Damage caused by use of your AMD Processor outside of specification or in excess of factory settings are not covered under your AMD product warranty and may not be covered by your system manufacturer's warranty.	
			DRAM Controller Configuration>	DRAM Power Options>	Power Down Enable [Enabled, Disabled, **Auto**]
				Cmd2T [1T, 2T, **Auto**]
				Gear Down Mode [Enabled, Disabled, **Auto**]
				LPDDR4 Refresh Mode [**Auto**, All Banks, per Bank]
			CAD Bus Configuration>	CAD Bus Timing User Controls [Manual, **Auto**]
				CAD Bus Drive Strength User Controls [Manual, **Auto**]
			Data Bus Configuration>	Data Bus Configuration User Controls [Manual, **Auto**]
			Common RAS>	Data Poisoning [Enabled, Disabled, **Auto**]
				DRAM Post Package Repair [Enabled, **Disabled**]
				RCD Parity [Enabled, **Disabled**, Auto]
				DRAM Address Command Parity Retry [Enabled, **Disabled**, Auto]
				Max Parity Error Replay [8]
				Write CRC Enable [Enabled, **Disabled**, Auto]
				DRAM Write CRC Enable and Retry Limit [Enabled, **Disabled**, Auto]

Sub-Screen	Function	Second level Sub-Screen/Description			
AMD CBS>	UMC Common Options>	DDR4 Common Options>	Common RAS>	Max Write CRC Error Reply [8]	
				Disable Memory Error Injection [**True**, False]	
				ECC Config.>	DRAM ECC Symbol Size [x4, x8, **Auto**]
					DRAM ECC Enable [Enabled, Disabled, **Auto**]
					DRAM UECC Retry [Enabled, **Disabled**]
			Security>	TSME [Enabled, Disabled, **Auto**]	
				Data Scramble [Enabled, Disabled, **Auto**]	
		DRAM Memory Mapping	Chip select Interleaving [Disabled, **Auto**]		
			BankGroupSwap [Disabled, **Auto**, CPU Mode, APU Mode, ALT Mode]		
			Address Hash Bank [Enabled, Disabled, **Auto**]		
			Address Hash CS [Enabled, Disabled, **Auto**]		
			Address Hash Rm [Enabled, Disabled, **Auto**]		
			SPD Read Optimization [**Enabled**, Disabled, Auto]		
		Phy Configuration>	PMU Training>	DFE Read Training [Enabled, Disabled, **Auto**]	
				FFE Write Training [Enabled, Disabled, **Auto**]	
		NVDIMM	Depends on configuration		
		Memory MBIST>	MBIST Enable [Enabled, **Disabled**]		
			MBIST Test Mode [**Auto**]		
			MBIST Aggressors [**Auto**]		
			MBIST per Bit Slave Die Reporting [**Auto**]		
			Data Eye	Pattern Select [**PRBS**, SSO, Both]	
				Pattern Length [3]	
				Aggressor Channel [Disabled, **1 Aggressor Channel**,	

Sub-Screen	Function	Second level Sub-Screen/Description		
AMD CBS>	UMC Common Options>	Memory MBIST>	Data Eye>	3 Aggressor Channels, 7 Aggressor Channels]
				Aggressor Static Lane Control [Enabled, **Disabled**]
				Target Static Lane Control [Enabled, **Disabled**]
				Data Eye Type [1D Voltage Sweep, 1D Timing Sweep, 2D Full Data Eye, **Worst Case Margin only**]
				Worst Case Margin Granularity [**Per Chip Select**, Per Nibble
				Read Voltage Sweep Step Size [**1**, 2, 4]
				Read Timing Sweep Step Size [**1**, 2, 4]
				Write Voltage Sweep Step Size [**1,** 2, 4]
				Write Timing Sweep Step Size [**1,** 2, 4]
	NBID Common Options>	IOMMU	[Enabled, Disabled, **Auto**]	
		PCIe ARI Support	[Enabled, Disabled, **Auto**]	
		PSPP Policy	[Enabled, Disabled, **Auto**]	
		GFX Configuration>	iGPU Configuration [**Auto,** iGPU Disable, UMA_SPECIFIED, UMA_AUTO, UMA_GAME_OPTIMIZED]	
			UMA Version [Legacy, Non-Legacy, Hybrid Secure, **Auto**]	
			GPU Host Translation Cache [Enabled, Disabled, **Auto**]	
		Audio Configuration>	NB Azalia [Enabled, Disabled, **Auto**]	
			Audio IOs [**Auto**, Azalia, SoundWire, Azalia and SoundWire, I2STDM and I2SBT, Azalia and I2SBT, SoundWire and I2SBT, Azalia mHDA]	
			PDM Mic Selection [**Auto,** Use 4 Channel, Use 6 Channel]	
		SMU Common Options>	Fan Control	Fan Control [Manual, **Auto**]

Sub-Screen	Function	Second level Sub-Screen/Description		
AMD CBS>	NBID Common Options>	SMU Common Options>	System Temperature Tracking	STT Control [Manual, **Auto**]
			STAPM Control	STAPM Control [Manual, **Auto**]
			SmartShift Control	SmartShift Control [Manual, **Auto**]
			System Configuration [10W POR Config–1 Commercial/Consumer, 15W POR Config–1 Commercial/Consumer, 25W POR Config–1 Commercial/Consumer, 35W POR Config–1 Commercial/Consumer, 45W POR Config–1 Commercial/Consumer, 54W POR Config–1 Commercial/Consumer, **Auto**]	
			Warning: Selecting System Configuration may cause system to hang, as some system configurations may not be supported by your OPN.	
			CPPC	Enable: override, Disable: set default [Enabled, Disabled, **Auto**]
	FCH Common Options>	SATA Configuration Options>	SATA Controller [Enabled, Disabled, **Auto**]	
			SATA Auto Shutdown [Enabled, Disabled, **Auto**]	
			SATA RAS Support [Enabled, Disabled, **Auto**]	
			SATA Disabled AHCI Prefetch Function [Enabled, Disabled, **Auto**]	
			Aggressive SATA Device Sleep Port 0 [Enabled, Disabled, **Auto**]	
			Aggressive SATA Device Sleep Port 1 [Enabled, Disabled, **Auto**]	
		USB Configuration Options>	XHCI0 Controller Enable [Enabled, Disabled, **Auto**]	
			XHCI1 Controller Enable [Enabled, Disabled, **Auto**]	
			Combo PHY Static Configuration>	Controller 0 COMBO PHY Static Config. [Type C, USB Only, DP, USB + DP, **Auto**]

Sub-Screen	Function	Second level Sub-Screen/Description		
AMD CBS>	FCH Common Options>	USB Configuration Options>	Combo PHY Static Configuration>	Controller 1 COMBO PHY Static Config. [Type C, USB Only, DP, USB + DP, **Auto**]
		AC Power Loss Option	AC Loss Control [Always Off, **Always On**, Reserved, Previous, Auto]	
		UART Configuration Options>	UART 0 Enable [**Enabled**, Disabled, Auto]	
			UART 0 Legacy Options [**Disabled**, 0x2E8, 0x2F8, 0x3E8, 0x3F8, Auto]	
			Warning: Console redirection will not work if UART legacy option sets to legacy address (0x2E8, 0x2F8, 0x3E8, 0x3F8).	
			UART 1 Enable [**Enabled**, Disabled, Auto]	
			UART 1 Legacy Options [**Disabled**, 0x2E8, 0x2F8, 0x3E8, 0x3F8, Auto]	
			Warning: Console redirection will not work if UART legacy option sets to legacy address (0x2E8, 0x2F8, 0x3E8, 0x3F8).	
			UART Driver Type [AMD UART Driver, **AMD Serial Driver**]	
		LPC Options	LPC Clock Run Control [Enabled, Disabled, **Auto**]	
	SoC Miscellaneous Control>	ABL Console Out Control	Auto keeps default behavior [**Auto**, Enabled, Disabled]	
		ABL PMU Message Control	Auto keeps default behavior [**Auto**]	
AMD PBS>	AMD Firmware Version	Read Only Field AMD Firmware Version AGESA Version, PSP Bootloader Version, PSP SecureOS Version, ABL Version, APCB Version, APOB Version, UCode Patch Version, SMU FW Version, DXIO FW Version, MP2 FW Version, KVM Engine Version, XHCI FW Version, VBIOS FW Version, GOP Driver Version, EC FW Version, USB PD Section 1/2 FW Version, TI PD FW Mode, TI PD FW Version		
	SSD Power Enable	[Disabled, SDD x1, **SDD x2**, SDD x4] Note: SDD1 test only, item breaks WWAN, LAN, WLAN PCIe slot		
	GPP8/9 Select	[**PCIE**, SATA]		
	HDD Power Enable	[**Enabled**, Disabled]		
	ODD Power Enable	[**Enabled**, Disabled		
	iSATA0 Power Enable	[Disabled]		
	iSATA1 Power Enable	[Disabled]		

Sub-Screen	Function	Second level Sub-Screen/Description
	Zero Power ODD	[Enabled, **Disabled**]
	DT Slot Power Enable	[Enabled x1 Lane 0, Enabled x2 Lane0+1, Enabled x4, **Disabled**]
	WWAN Power Enable	[Enabled, **Disabled,** Manual]
	LAN Power Enable	[Enabled, **Disabled,** Manual]
	WLAN/WIFI Power Enable	[Enabled, **Disabled,** Manual]
	Front Camera 0 Enable	[Enabled, **Disabled**]
	Front Camera 1 Enable	[Enabled, **Disabled**]
	USB Camera Enable	[Enabled, **Disabled**]
	EVAL Slot Power Enable	[Enabled, **Disabled**]
	Power Sensors Routing Select	[**MP2_SFH**, MP2_Walle]
	Eval Card T-Diode Routing Select	[**EC**, APU SMBUS0]
	Special Display Features	[**Disabled**, HybridGraphics]
	D3Cold Support	[Enabled, **Disabled**]
	NVIDIA DGPU Power Enable	[Enabled, **Disabled**]
	Non-Eval Discrete GPU Support	[Enabled, **Disabled**]
	Discrete GPU HPD Circuitry	[**OR Circuitry**, Pulse Circuitry]
	Discrete GPU Audio	[**Disabled**, Keep ROM Strap Setting]
	Discrete GPU BOMACO Support	[Enabled, **Disabled**]
	Primary Video Adapter	[**Int Graphics (IGD)**, Ext Graphics (PEG)]
	Wake on Voice	[Enabled, **Disabled**]
	ACP Power Gating	[Enabled, **Disabled**]
	ACP Clock Gating	[Enabled, **Disabled**]
	Above 4G MMIO Limit	Select Above 4GB MMIO Limit range (35 to 48 bits) [35 bit (32 GB), 36 bit (64 GB), 37 bit (128 GB), 38 bit (256 GB), 39 bit (512 GB), **40 bit (1 TB)**, 41 bit (2 TB), 42 bit (4 TB), 43 bit (8 TB), 44 bit (16 TB), 45 bit (32 TB), 46 bit (64 TB), 47 bit (128 TB), 48 bit (256 TB)]
	NvME RAID Mode	[Enabled, **Disabled**]
	StallForUnlock	[Enabled, **Disabled**]
	HDT BreakPoint for Boot	[Enabled, **Disabled**]
	SW BreakPoint for S3	[Enabled, **Disabled**]
	Touch Panel Support	[Under I2C 0 Bus, Under I2C 1 Bus, Under I2C 2 Bus, Under I2C 3 Bus, ELAN TSP Under I2C 0 Bus, ELAN TSP Under I2C 1 Bus, ELAN TSP Under I2C 2 Bus, ELAN TSP Under I2C 3 Bus, Under USB 6 Bus, **Disabled**]

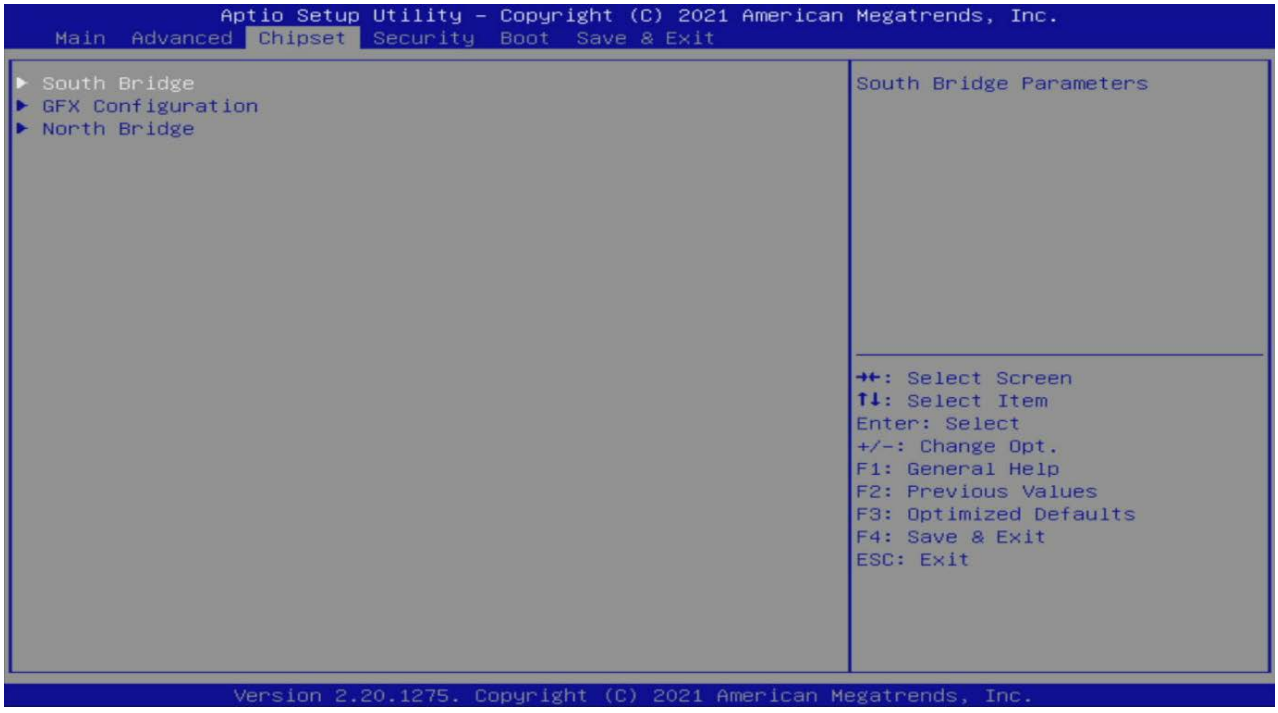
Sub-Screen	Function	Second level Sub-Screen/Description
AMD PBS>	Touch Pad Support	[Under I2C 0 Bus, Under I2C 1 Bus, Under I2C 2 Bus, Under I2C 3 Bus, **Disabled**]
	Nfc Support	[Under I2C 0 Bus, Under I2C 1 Bus, Under I2C 2 Bus, Under I2C 3 Bus, **Disabled**]
	ALS Support	[Under I2C 0 Bus, Under I2C 1 Bus, Under I2C 2 Bus, Under I2C 3 Bus, **Disabled**]
	DP2/HDMI2 Over USB-C0	[Native USB Type-C, HDMI Over USB Type-C, **DP Over USB Type-C**]
	DP3/HDMI3 Over USB-C1	[Native USB Type-C, HDMI Over USB Type-C, **DP Over USB Type-C**]
	DP0 Select	[**EDP Display**, DP Display, HDMI Display]
	DP1 Select	[**DP Display**, HDMI Display]
	Serial Debug Message under OS	[Enabled, **Disabled**]
	Wireless LAN Recovery	[Enabled, **Disabled**]
	UCSI Support	[Enabled, **Disabled**]
	Charger Mode (NVDC vs. BYPASS)	[Enabled, **Disabled**]
	S3/Modern Standby Support	[S3 Enable, **Modern Standby Enable**]
	Modern Standby Type	[Modern Standby + SOI2, **Modern Standby + SOI3**, Modern Standby + SOI2 + SOI3]
	Reduce Hardware Support	[Enabled, **Disabled**]
	MS Resource	[**Enabled**, Disabled]
	Wake on PME	[**Enabled**, Disabled]
	Sensor Fusion User Mode Driver	[Enabled, **Disabled**]
	MITT/WITT Selection	[MITT Only, WITT Only, **Both Disabled**]
	Unused GPP Clocks Off	[**Enabled**, Disabled]
	Clock PM: CLK_REQ 0,1,2,3,4,5,6	[**Enabled**, Disabled]
	KBC Support	[**Enabled**, Disabled]
	AcDcSwitch	[Enabled, **Disabled**]
	VDDP Voltage	[**VDDP Voltage (0.75V)** ……. VDDP Voltage (-100 mV)]
	VDD18 Voltage	[**VDD18 Voltage (1.8V)** …….. VDD18 Voltage (ANPEC: 130 mV/TI:-137.5mV]
	5V_S5 Voltage	[**5V-ALW (default)**, 5V_ALW + 60mV, 5V_ALW + 100mV]
	AMD KVM Mouse Protocol	[Absolute, Simple, **Auto**]
	AMD DPTC Interface	[Enabled, **Disabled**]
	STT Sensor Reporting	[**Disabled**, Report onboard Sensors, Report onboard + Eval card Sensors]
	Blink LED	[**Enabled**, Disabled, GPIO 11 Output Low, GPIO 11 Output High]]
	iLA TraceMemoryEN	[Enabled, **Disabled**]

Sub-Screen	Function	Second level Sub-Screen/Description	
AMD PBS>	iLA TraceMemoryEN Reserved MMIO	[0]	
Intel(R) Ethernet Controller>	Read only Field UEFI Driver, Device name, PCI Device ID, Link Status, MAC Address		
RAM Disk Configuration>	Disk Memory Type	**[Boot Service Data**, Reserved]	
	Create Raw>	Size	The valid RAM disk size should be multiples of the RAM disk block size [1]
		Create and Exit	
		Discard and Exit	
	Create from File	Create a RAM Disk from a given File	
	Created RAM Disk List		
	RAM Disk 0: # RAM Disk 1: # RAM Disk 2: #	Select to remove [Enabled, **Disabled**]	
	Remove Selected RAM Disks	Remove selected RAM disk(s)	
Driver Health>	Intel® Gigabit 0.9.03 Healthy>	Controller caoab218 Child 0 Healthy	Provides Health status for drivers and controllers
		Intel ® Ethernet controller (3) I225-LM	Provides Health status for drivers and controllers

6.4.3. Chipset Setup Menu

The Chipset Setup menu lists sub-screens and second level sub-screens of the functions supported within the Chipset setup menu.

Figure 14: Chipset Setup Menu



The following table shows Chipset sub-screens and describes the function. Default settings are in **bold**.

Table 29: Chipset Setup Menu Sub-screens and Functions

Function	Second level Sub-Screen/Description		
South Bridge>	SB USB Configurtion>	XHCI0 Port 0	[**Enabled**, Disabled]
		XHCI0 Port 1	[**Enabled**, Disabled]
		XHCI0 Port 2	[**Enabled**, Disabled]
		XHCI0 Port 3	[**Enabled**, Disabled]
		XHCI1 Port 0	[**Enabled**, Disabled]
		XHCI1 Port 1	[**Enabled**, Disabled]
		XHCI1 Port 2	[**Enabled**, Disabled]
		XHCI1 Port 3	[**Enabled**, Disabled]
	SB Power Saving>	AB Clock Gating	[Enabled, Disabled, **Auto**]
		PCIB Clock Run	[Enabled, Disabled, **Auto**]
	SB Debug Configuration>	SB SATA Debug Configuration>	SATA MAXGEN2 CAP Option [Enabled, Disabled, **Auto**]
			SATA CLK Mode Option [Ext 25 MHz, Int 48 MHz, Int 100 MHz, **Auto**]

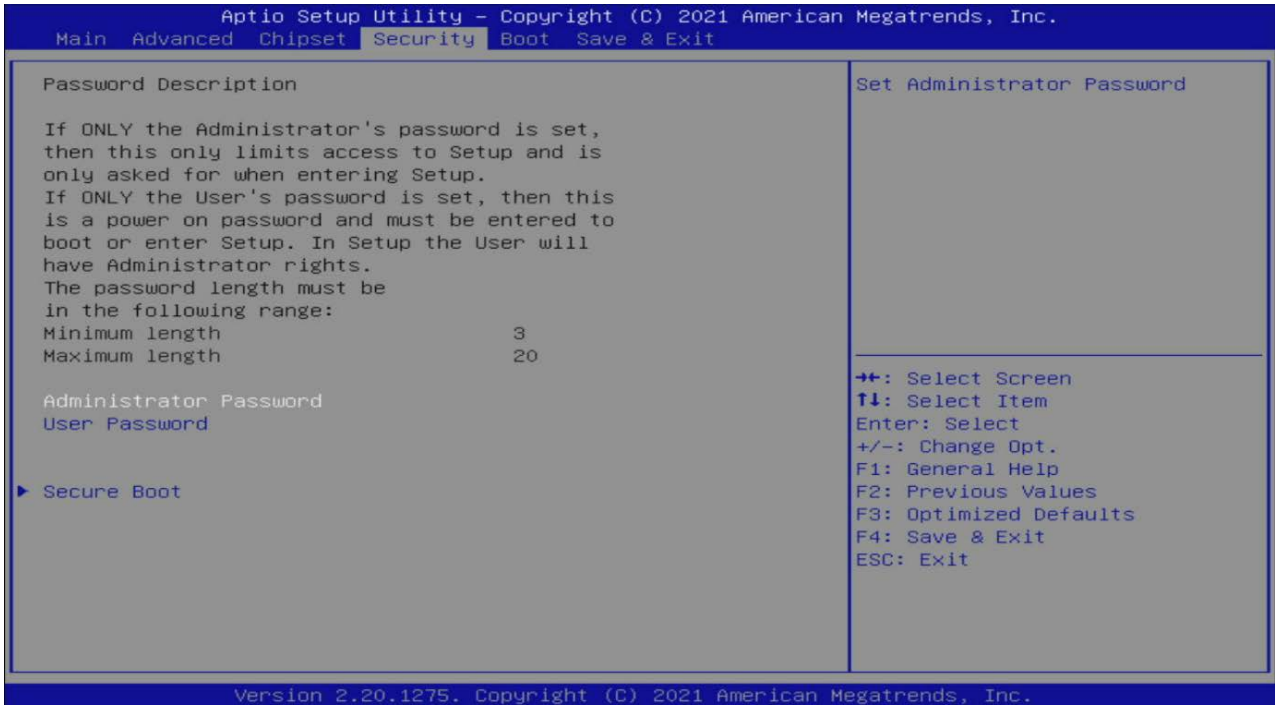
Function	Second level Sub-Screen/Description		
South Bridge>	SB Debug Configuration>	SB SATA Debug Configuration>	Aggressive Link PM Capability [Enabled, Disabled, **Auto**]
			Port Multiplier Capability [Enabled, Disabled, **Auto**]
			SATA Ports Auto Clock Control [Enabled, Disabled, **Auto**]
			SATA Partial State Capability [Enabled, Disabled, **Auto**]
			SATA FIS Based Switching [Enabled, Disabled, **Auto**]
			SATA Command Completion Coalescing Support [Enabled, Disabled, **Auto**]
			SATA Slumber State Capability [Enabled, Disabled, **Auto**]
			SATA MSI Capability Support [Enabled, Disabled, **Auto**]
			SATA Target Support 8 Devices [Enabled, Disabled, **Auto**]
			Generic Mode [Enabled, Disabled, **Auto**]
			SATA AHCI Enclosure [Enabled, Disabled, **Auto**]
			SATA SGPIO 0 [Enabled, Disabled, **Auto**]
		SB Fusion Debug Configuration>	Clock Interrupt Tag [Enabled, Disabled, **Auto**]
		SM Misc. Debug Configuration>	SB Clock Spread Spectrum [Enabled, Disabled, **Auto**]
			HPET in SB [Enabled, Disabled, **Auto**]
			MsiDis in HPET [Enabled, Disabled, **Auto**]
			-OSC for PCIO [Enabled, Disabled, **Auto**]
			GPP Serial Debug Bus Enable [Enabled, Disabled, **Auto**]
GFX Configuration>	Remote Display Features	[**Enabled**, Disabled]	
	Gnb Hd Audio	[**Enabled**, Disabled]	
	IGD – AmdGop Output Priority	[**Default**, Manually]	

Function	Second level Sub-Screen/Description	
GFX Configuration>	eDP Port Configuration	[**Enabled**, Disabled]
	Integrated eDP to LVDS bridge	[Disabled, **Auto**]
	LFP Resolution	[**Auto** [VGA 640x480 1x18, WVGA 800x480 1x18, SVGA 800x600 1x18 XGA 1024x768 1x18, XGA 1024x768 1x24, WXGA 1280x768 1x24, WXGA 1280x800 1x18, WVGA 1366x768 1x24, WSVGA 1024x600 1x18 WSVGA 1024x600 1x24, WXGA+ 1440x900 2x18, WXGA+ 1440x900 2x24 SXGA 1280x1024 2x18, SXGA 1280x1024 2x24, WSXGA+ 1680x1050 2x18 WSXGA+ 1680x1050 2x24, UXGA 1600x1200 2x18, UXGA 1600x1200 2x18 WUXGA 1920x1200 2x18, WUXGA 1920x1200 2x18, FHD 1920x1080 2x18 FHD 1920x1080 2x24, Custom]
	Panel Channel Mode	[**Auto**, Single, Dual]
	Backlight Control	[None/External, **PWM**, PWM Inverted, I2C, I2C Inverted]
	PWM Frequency	[**200 Hz**, 400 Hz, 1 kHz, 2kHz, 4 kHz, 8 kHz, 20 kHz, 40 kHz]
	Backlight Value	[255]
	LVDS Clock Center Spreading	[**No spreading**, 0.5%, 1.0%, 1.5%, 2.0%, 2.5%]
North Bridge>	Socket 0 Information	Read only Field Socket 0 Information: Start address, End address, channel 1A/1B (DIMM size, Current speed, Max speed)

6.4.4. Security Setup Menu

The security Setup menu lists sub-screens and second level sub-screens of the functions supported within the

Figure 15: Security Menu Setup



The following table shows the Security sub-screens and describes the function. Default settings are in **bold**.

Table 30: Security Setup Menu Sub-screens and Functions

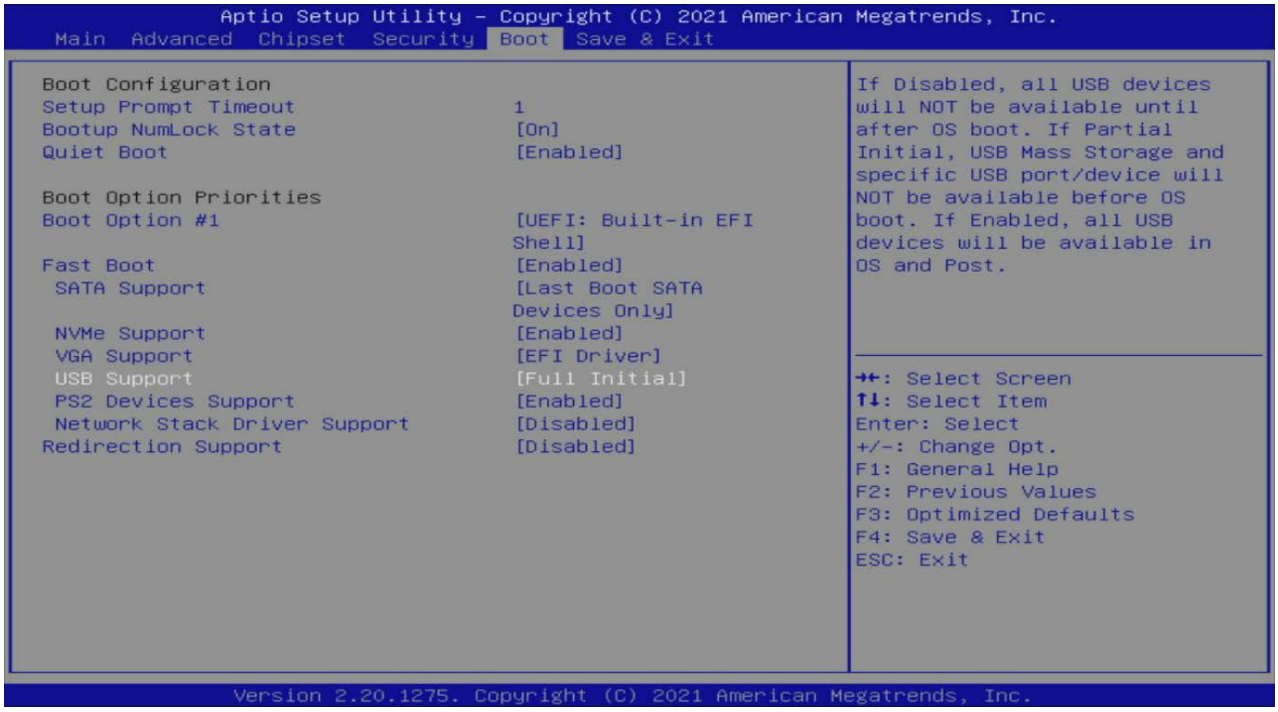
Function	Description	
Administrator Password>	Sets administrator password	
User Password>	Sets user password	
Secure Boot>	[Enabled, **Disabled**]	
	Secure Boot Mode	[**Custom**, Standard]
	Restore Factory Keys	Force System to user mode and install factory default secure Boot Key databases. [Yes, No]
	Reset to Set Up Mode	
	Key Management	
	Vendor Key	[valid]
	Factory Key Provision	Install factory default Secure Boot keys after the platform reset and while the system is in Setup mode [Enabled, **Disabled**]
	Restore Factory Keys	Force System to user mode and install factory default Secure Boot Key databases. [Yes, No]
	Reset to Setup Mode	

Function	Description	
Secure Boot>	Export Secure Boot Variables	Copy NVRAM content of secure Boot variable to file in a root folder on a file system device.
	Enroll Efi Image	Allow the image to run in secure boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database.
	Device Guard Ready	
	Remove 'UEFI CA' from DB	
	Restore DB Defaults	Restore DV variable to factory default.
	Secure Boot Variable	
	Platform Key	Size / Keys / Key Source
	Key Exchange Keys	Size / Keys / Key Source
	Authorized Signatures	Size / Keys / Key Source
	Forbidden Signatures	Size / Keys / Key Source
	Authorized Time Stamps	Size / Keys / Key Source
	OSRecovery Signatures	Size / Keys / Key Source

6.4.5. Boot Setup Menu

The Boot Setup menu lists sub-screens of the functions supported within the Boot setup menu.

Figure 16: Boot Setup Menu



The following table shows the Boot Setup sub-screens and describes the function. Default settings are in **bold**.

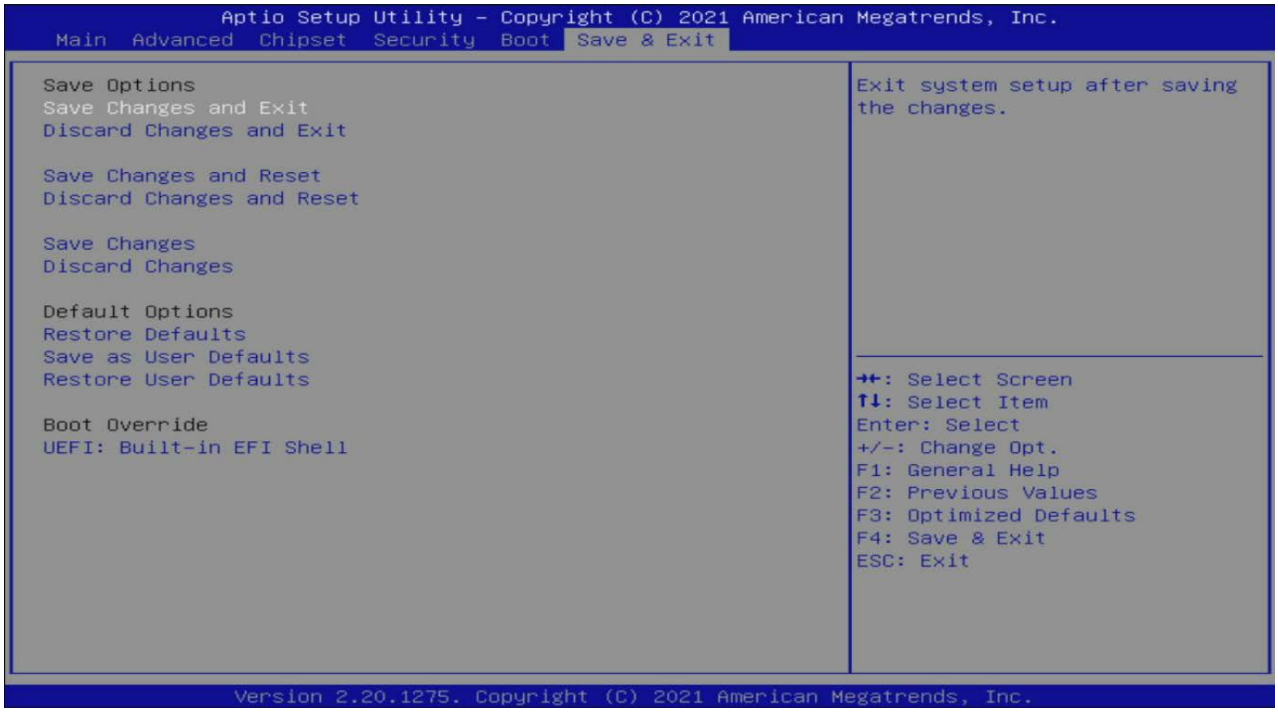
Table 31: Boot Setup Menu Sub-screens and Functions

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 SATA Devices Only**, All SATA Devices]
NVMe Support	[**Enabled**, Disabled]
VGA Support	[**EFI Driver**, Auto]
USB Support	[Disabled, **Full Initial**, Partial Initial]
PS2 Device Support	[**Enabled**, Disabled]
Network Stack Driver Support	[Enabled, **Disabled**]
Redirection Support	[Enabled, **Disabled**]

6.4.6. Save and Exit Setup Menu

The Save and Exit Setup menu lists sub-screens of the functions supported within the Save and Exit setup menu.

Figure 17: Save and Exit Setup Menu



The following table shows the Save and Exit sub-screens and describes the function.

Table 32: Save and Exit Setup Menu Sub-screens and 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
Boot Override	Attempts to launch the built-in EFI Shell

6.5. 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.

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

6.5.1. Entering the uEFI Shell

To enter the uEFI Shell, follow the steps below:

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

```
EFI Shell version 2.40 [5.11]
Current running mode 1.1.2
Sevice mapping table
Fs0      :HardDisk - Alias hd33b0b0b fs0
Acpi(PNP0A03,0)/Pci(1D|7)/Usb(1, 0)/Usb(1, 0)/HD(Part1,Sig17731773)
```

4. Press the <ESC> key within 5 seconds to skip startup.nsh, and any other key to continue.
5. The output produced by the device-mapping table can vary depending on the board's configuration.
6. If the <ESC> key is pressed before the 5 second timeout elapses, the shell prompt is shown:

```
Shell>
```

6.5.2. 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 boots from.
2. Reset the board using the **reset** uEFI Shell command.

6.6. uEFI Shell Scripting

6.6.1. Startup Scripting

If the <ESC> key is not pressed and the timeout has run out, then the uEFI Shell automatically tries to execute some startup scripts. The UEFI shell 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.

6.6.2. 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.

6.6.3. Example of Startup Scripts

6.6.3.1. 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
```

6.7. Firmware Update

Firmware updates are typically delivered as a ZIP archive. Please find the latest available BIOS-ZIP archive on Kontron's Customer Section. Further information about the firmware update procedure can be found in the included "flash_instruction.txt"-file.

To get access to BIOS downloads and PCNs, register for Kontron's Customer Section

7/ 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

The serial number can be found on the Type Label.

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

7.1. 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.

7.2. 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 Kontron's the RMA Information website: https://www.kontron.com/en/support/rma-information.
2. Download the RMA Request sheet for **Kontron Europe GmbH- Deggendorf** 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.
3. 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

4. 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.

5. 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.

List of Acronyms

Table 33: List of Acronyms

ACPI	Advanced Configuration and Power Interface
API	Application Programming Interface
APU	Accelerated Processor Unit
BIOS	Basic Input Output System
bps	bits per second
BSP	Board Support Package
Carrier Board	Application specific circuit board that accepts a COM Express ® module
COM	Computer-on-Module
COMe-b	COM Express® b=basic 125 mm x 95 mm module form factor
COMe-c	COM Express® c=compact 95 mm x 95 mm module form factor
COMe-m	COM Express® m=mini 84 mm x 55 mm module form factor
DDC	Display Data Control
DDI	Digital Display Interface –
DDIO	Digital Display Input/Output
DDR	Double Data Rate
DIMM	Dual In-line Memory Module
DP	DisplayPort
DMA	Direct Memory Access
DRAM	Dynamic Random Access Memory
DVI	Digital Visual Interface
EAPI	Embedded Application Programming Interface
ECC	Error Checking and Correction
Eeep	Embedded EEPROM
EEPROM	Electrically Erasable Programmable Read-Only Memory
EDID	Extended Display Identification Data
eDP	Embedded Display Port
EMC	Electromagnetic Compatibility (EMC)
ESD	Electro Sensitive Device
FAT	File Allocation Table
FCH	Fusion Controller Hub
FIFO	First In First Out
Gb	Gigabit
GbE	Gigabit Ethernet
GPI	General Purpose Input
GPIO	General Purpose Input Output
GPO	General Purpose Output
GPP	Group Policy Preferences
GPU	Graphics Processing Unit
HDA	High Definition Audio (HD Audio)
HD/HDD	Hard Disk /Drive
HDMI	High Definition Multimedia Interface
HWM	Hardware Monitor
I²C	Inter integrated Circuit Communications
ICM	Integrated Connector Module
IOT	Internet of Things
ISA	Industry Standard Architecture
JILI	JUMPtec Intelligent LVDS Interface
KEAPI	Kontron Embedded API
LAN	Local Area Network
LPC	Low Pin-Count Interface:
LPT	Line Printing Terminal
LVDS	Low Voltage Differential Signaling
MDI	Medium Dependent Interface
MLC	Multi Level Cell
MTBF	Mean Time Before Failure
NA	Not Available
NC	Not Connected
NVMe	Non Volatile Memory express
OS	Operating System
PCH	PLatform Controller Hub
PCI	Peripheral Component Interface
PCIe	PCI-Express
PECI	Platform Environment Control Interface
PEG	PCI Express Graphics
PICMG®	PCI Industrial Computer Manufacturers Group
PHY	Ethernet controller physical layer device
Pin-out Type	COM Express® definitions for signals on COM Express® Module connector pins.
pSLC	pseudo Single Level Cell
PSU	Power Supply Unit
RoHS	Restriction of the use of certain Hazardous Substances
RTC	Real Time Clock
SATA	Serial AT Attachment:
SSD	Solid State Drive
SFX	Small Formfactor ATX
SGMII	Serial Gigabit Media Independent Interface
SLC	Single Level Cell
SMB	System Management Bus
SoC	System on a Chip
SOIC	Small Outline Integrated Circuit
SPI	Serial Peripheral Interface
TBC	To Be Confirmed
TBD	To Be Decided
TPM	Trusted Platform Module
UART	Universal Asynchronous Receiver Transmitter
UEFI	Unified Extensible Firmware Interface
UK CA	UK Conformity Assessed
USB	Universal Serial Bus
VGA	Video Graphics Adapter
WDT	Watchdog Timer
WEEE	Waste Electrical and Electronic Equipment
WOL	Wake On LAN

About Kontron – Member of the S&T Group

Kontron is a global leader in IoT/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**

GLOBAL HEADQUARTERS

Kontron Europe GmbH
Gutenbergstraße 2
85737 Ismaning
Germany
Tel.: + 49 821 4086-0
Fax: + 49 821 4086-111
info@kontron.com