COMe-cAS6 (E2)

Rev 1.1

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User Guide - COMe-cAS6 (E2)

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You understand and agree that your use of JUMPtec 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 JUMPtec hardware or software components incorporated in your systems) meet all applicable requirements. Unless otherwise stated in the product documentation, the JUMPtec 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 JUMPtec 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 on our JUMPtec website.

NOTICE	This product is not intended for use or 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 JUMPtec Support.

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Revision History

Revision	Brief Description of Changes	Date of Issue	Author
1.0	Release version	2025/08/28	IH
1.1	Typo removed	2025/09/03	IH

Terms and Conditions

JUMPtec 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 https://www.jumptec.com/en/terms-and-conditions.
JUMPtec sells products worldwide and declares regional General Terms & Conditions of Sale, and Purchase Order Terms & Conditions. Visit https://www.jumptec.com/en/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 JUMPtec contacts by visiting https://www.jumptec.com/en/service-support.

Customer Service

As a trusted technology innovator and global solutions provider, JUMPtec 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 JUMPtec to provide exceptional peace of mind to build and maintain successful products.
For more details on JUMPtec's service offerings such as: enhanced repair services, extended warranty, JUMPtec training academy, and more visit https://www.jumptec.com/en/service-support.

Customer Comments

If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact JUMPtec 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 **ATTENTION** indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées.
	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.
	Caution: HOT Surface! Do NOT touch! Allow to cool before servicing. Attention : Surface CHAUDE ! Ne pas toucher ! Laissez refroidir avant de procéder à l'entretien.
	Caution: Laser! This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new JUMPtec 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 JUMPtec 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 JUMPtec 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. Follow the "General Safety Instructions" supplied with the product.

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 lithium battery.

> ⚠️ **CAUTION** Risk of Explosion if the lithium Battery is replaced by an incorrect Type. Dispose of used lithium batteries According to the instructions.
> Risque d'explosion si la pile au lithium est remplacée par une pile de type incorrect. Éliminez les piles au lithium usagées conformément aux instructions.

General Instructions on Usage

In order to maintain JUMPtec'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 JUMPtec and described in this user guide or received from JUMPtec 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

JUMPtec 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 JUMPtec's quality and environmental responsibilities, visit https://www.jumptec.com/en/about-jumptec/quality.

Disposal and Recycling

JUMPtec'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 JUMPtec.
JUMPtec follows the WEEE directive
You are encouraged to return our products for proper disposal.

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1/General Safety Instructions

Please read this passage carefully and take careful note of the instructions, which have been compiled for your safety and to ensure to apply in accordance with intended regulations. If the following general safety instructions are not observed, it could lead to injuries to the operator and/or damage of the product; in cases of non-observance of the instructions JUMPtec is exempt from accident liability, this also applies during the warranty period.

The product has been built and tested according to the basic safety requirements for low voltage (LVD) applications and has left the manufacturer in safety-related, flawless condition. To maintain this condition and to also ensure safe operation, the operator must not only observe the correct operating conditions for the product but also the following general safety instructions:

❯ The product must be used as specified in the product documentation, in which the instructions for safety for the product and for the operator are described. These contain guidelines for setting up, installation and assembly, maintenance, transport or storage.

❯ The on-site electrical installation must meet the requirements of the country's specific local regulations.

❯ If a power cable comes with the product, only this cable should be used. Do not use an extension cable to connect the product.

❯ To guarantee that sufficient air circulation is available to cool the product, please ensure that the ventilation openings are not covered or blocked. If a filter mat is provided, this should be cleaned regularly. Do not place the product close to heat sources or damp places. Make sure the product is well ventilated.

❯ Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the JUMPtec Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1 .

❯ Only products or parts that meet the requirements for Power Source (PS1) of UL/IEC 62368-1 may be connected to the product's available interfaces (I/O).

❯ Before opening the product, make sure that the product is disconnected from the mains.

❯ Switching off the product by its power button does not disconnect it from the mains. Complete disconnection is only possible if the power cable is removed from the wall plug or from the product. Ensure that there is free and easy access to enable disconnection.

❯ The product may only be opened for the insertion or removal of add-on cards (depending on the configuration of the product). This may only be carried out by qualified operators.

❯ If extensions are being carried out, the following must be observed:

❯ all effective legal regulations and all technical data are adhered to

❯ the power consumption of any add-on card does not exceed the specified limitations

❯ the current consumption of the product does not exceed the value stated on the product label

❯ Only original accessories that have been approved by JUMPtec can be used.

❯ Please note: safe operation is no longer possible when any of the following applies:

❯ the product has visible damages or

❯ the product is no longer functioning
In this case the product must be switched off and it must be ensured that the product can no longer be operated.

❯ Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled.

❯ CAUTION: Risk of explosion if the lithium battery is replaced incorrectly (short-circuited, reverse-poled, wrong lithium battery type). Dispose of used lithium batteries according to the manufacturer's instructions.

❯ This product is not suitable for use in locations where children are likely to be present

Additional Safety Instructions for DC Power Supply Circuits

❯ To guarantee safe operation, please observe that:

❯ the external DC power supply must meet the criteria for LPS and PS2 (UL/IEC 62368-1)

❯ no cables or parts without insulation in electrical circuits with dangerous voltage or power should be touched directly or indirectly

❱ a reliable functional earth connection is provided

❱ a suitable, easily accessible disconnecting device is used in the application (e.g. overcurrent protective device), if the product itself is not disconnect able

❱ a disconnect device, if provided in or as part of the product, shall disconnect both poles simultaneously

❱ interconnecting power circuits of different products cause no electrical hazards

❱ A sufficient dimensioning of the power cable wires must be selected – according to the maximum electrical specifications on the product label – as stipulated by EN62368-1 or VDE0100 or EN60204 or UL61010-1 regulations.

For the General Safety Instruction in German or French, visit JUMPtec's product web page> Downloads> Manuals> General Safety Instructions.

1.1. Electrostatic Discharge (ESD)

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry. Therefore, proper packaging and grounding techniques are necessary precautions to prevent damage.
Always take the following precautions:

	ESD Sensitive Device! Keep electrostatic sensitive parts in their containers until they arrive at the ESD-safe workplace. Always be properly grounded when touching a sensitive board, component, or assembly.

For more Information, see the Special Handling and Unpacking Instruction within this user guide and the following Chapter Grounding Methods.

1.2. Grounding Methods

The following measures help to avoid electrostatic damages to the device:

❱ Cover workstations with approved antistatic material. Always wear a wrist strap connected to the workplace, as well as properly grounded tools and equipment.

❱ Use antistatic mats, heel straps, or air ionizers for more protection.

❱ Always handle electrostatically sensitive components by their edge or by their casing.

❱ Avoid contact with pins, leads, or circuitry.

❱ Switch off power and input signals before inserting and removing connectors or connecting test equipment.

❱ Keep the work area free of non-conductive materials such as ordinary plastic assembly aids and styrofoam.

❱ Use field service tools such as cutters, screwdrivers, and vacuum cleaners that are conductive.

❱ Always place drives and boards with the PCB-assembly-side down on the foam.

1.3. Instructions for Lithium Battery

If the product is equipped with a lithium battery, there is a risk of explosion if the lithium battery is replaced incorrectly (short-circuited, reverse-poled, wrong lithium battery type). Dispose of used batteries according to the manufacturer's instructions.

⚠CAUTION	Risk of Explosion if the lithium battery is replaced by an incorrect Type. Dispose of used batteries according to the instructions. Risque d'explosion si la pile au lithium est remplacée par une pile de type incorrect. Éliminez les piles au lithium usagées conformément aux instructions

Do not dispose of lithium batteries in general trash collection. Dispose of the lithium battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

2/Product Introduction

This user guide describes the COM Express® compact Computer-on-Module COMe-cAS6 (E2) made by JUMPtec and focuses on describing the module's special features. JUMPtec recommends users to study this user guide before powering on the module.

2.1. Product Naming Clarification

Table 1: COM Express® Product Naming Clarification

Standard short form	Module form factor	Processor family identifier	Pinout type	Available temperature variants
COMe-	b= basic (125mm x 95mm) c= compact (95mm x 95mm) m= mini (84mm x 55mm)	EL = Elkhart Lake RP = Raptor Lake AS = Amston Lake etc.	6 = Type 6 7 = Type 7 10 = Type 10	none = Commercial Extended (E1) Industrial (E2) Screened industrial (E2S)

2.2. Product Description

The COMe-cAS6 (E2) is a small form factor COM Express® compact Computer-On-Module designed for flexible implementation within multiple embedded industrial environments. The COMe-cAS6 (E2) is based on the Intel® Atom™ processors (Codename: Amston Lake & Alder Lake N) with an integrated PCH to combine increased efficiency and performance with TDP as low as 6 W and no more than up to 15 W, including Intel's® extensive HD Graphics capabilities.

Key features are:

> Low-Power – Performance/Watt optimized form factor solution
> Up to 16 GByte DDR5 4800 MT/s - In-Band ECC
> Up to 4x Graphics interfaces
> Up to 6x PCIe lanes
> Up to 4x USB 3.2/2.0, 4x USB 2.0
> Up to 2.5 GbE with TSN support
> Support for Industrial and commercial temperature grade environments

2.3. COM Express® Documentation

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

2.4. COM Express® Compact Type 6 Functionality

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

Table 2: COM Express® compact Type 6 and COMe-cAS6 (E2) functionality

Interface	COM Express compact Type 6 min/max	COMe-cAS6 (E2)	Comment
PCI Express Lanes 0 - 5	1/4	Up to 6	Default: 4x PCIe lanes
PCI Express Lanes 6,7	0/2	0	
PCI Express Lanes 16 - 31 (PEG)	0/16	0	
NBASE-T	1 /1	1	Up to 2.5GBASE-T
DDI 1-3	0/3	3	
VGA	0/1	1	Optional, mutually exclusive with DDI3
Dual Channel LVDS	0/1	1	
eDP on LVDS CH A pins	0/1	1	Optional, mutually exclusive with LVDS

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MIPI-CSI connectors	0/2	2	Optional
Serial 0,1	0/2	2	
CAN on Ser1	0/1	1	Optional
SATA	1/4	2	
HD Audio	0/1	1	
Soundwire	0/1	1	Optional
USB 2.0	4/8	8	
USB Client	0/1	1	Optional
USB 3.2 Gen1 or Gen2	0/4	Up to 4 USB 3.2 Gen2	Default: 2x USB 3.2 Gen1 Optional: 4x USB 3.2 Gen1 Up to USB 3.2 Gen2 with re-timer on carrier
USB4 (on DDI pins)	0/2	0	
LPC or eSPI	1/1	1	Default LPC, optional eSPI
BOOT_SPI	1/1	1	
GP_SPI	0/1	1	
SMB	1/1	1	
GPIO	8/8	8	
SDIO (muxed on GPIO)	0/1	0	SDIO not supported by processor platform

2.5. 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 JUMPtec 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.

3/Product Specification

3.1. Module Variants

3.1.1. Industrial Temperature Grade Modules (E2, -40°C to +85°C)

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

Part Number	Product Name	CPU	SODIMM Socket	eMMC TLC	Use Condition
36039-0000-R1-2	COMe-cAS6 E2 x7211RE	x7211RE	1	none	embedded* / industrial, extended temperature
36039-0000-R2-2	COMe-cAS6 E2 x7213RE	x7213RE	1	none	embedded* / industrial, extended temperature
36039-0000-R2-4	COMe-cAS6 E2 x7433RE	x7433RE	1	none	embedded* / industrial, extended temperature
36039-0000-R2-8	COMe-cAS6 E2 x7835RE	x7835RE	1	none	embedded* / industrial, extended temperature

* Default configuration of the module is embedded

3.2. Accessories

Accessories are product specific, COM Express ® specific or general COM accessories. For more information, contact your local JUMPtec Sales Representative or JUMPtec Inside Sales.

3.2.1. SODIMMs

Table 4: SODIMMs for COMe-cAS6 (E2)

P/N	Product Name	Description
97041-0848-CAS6	DDR5-4800 SODIMM 8GB E2_CAS6	DDR5-4800, 8GB, 262P, PC5-4800 SODIMM, industrial temperature
97041-1648-CAS6	DDR5-4800 SODIMM 16GB E2_CAS6	DDR5-4800, 16GB, 262P, PC5-4800 SODIMM, industrial temperature

3.2.2. Cooling

A standard heat spreader solutions can be used, which are available in a threaded and non-threaded (through hole) version.

Table 5: Cooling Equipment for COMe-cAS6 (E2)

P/N	Product Name	Description
36039-0000-99-0	HSP COMe-cAS6 (E2) threaded	Heatspreader for COMe-cAS6 commercial and E2, threaded mounting holes
36039-0000-99-1	HSP COMe-cAS6 (E2) through	Heatspreader for COMe-cAS6 commercial and E2, through mounting holes
36099-0000-99-4	COMe Active Uni Cooler2 (w/o HSP)	COM Express® Universal Active Cooler for Heatspreader Mounting (95x95x14.3) - 90° turnable
36099-0000-99-5	COMe Passive Uni Cooler2 (w/o HSP)	COM Express® Universal Passive Cooler for Heatspreader Mounting (95x95x14.3) - 90° turnable

3.2.3. Evaluation Carrier

Table 6: Evaluation Carrier

P/N	Product Name	Description
38116-0000-00-0	COMe Eval Carrier2 T6 8mm	COM Express® Eval Carrier 2 Type 6 with 8mm COMe connector
38116-0000-00-5	COMe Eval Carrier2 T6 5mm	COM Express® Eval Carrier 2 Type 6 with 5mm COMe connector

3.2.4. Others

Table 7: Various

P/N	Product Name	Description
96079-0000-00-0	KAB-HSP 200mm	Fan cable adapter for 3pin standard FAN connector to 3pin molex connector, cable length 200mm
96079-0000-00-2	KAB-HSP 40mm	Fan cable adapter for 3pin standard FAN connector to 3pin molex connector, cable length 40mm
38017-0000-00-0	COMe Mount Kit 8mm 1set	Mounting Kit for 1 module with screws for 8mm COMe connector
38017-0000-00-5	COMe Mount Kit 5mm 1set	Mounting Kit for 1 module with screws for 5mm COMe connector

3.3. Functional Specification

3.3.1. Technical Data

Table 8: Technical Data

Function	Definition
Compliance	COM Express® Compact Pin-out Type 6, COM.0 Rev 3.1 - backwards compatible
Dimension (H X W)	95 mm x 95 mm
Processors	Intel Processor N-Series, Intel Core i3, Intel Core 3, Intel® Atom® x7000E / x7000RE Processor Series
Chipset	Integrated in SOC
Main Memory	Up to 16 GByte DDR5 4800 MT/s via 1x SODIMM socket (In-Band ECC)
Graphics Controller	Intel® UHD Graphics
Display	DDI1/DDI2/DDI3: DP++, optional: VGA, mutially exclusive with DDI3 LVDS: Dual Channel 18/24bit optional: eDP, mutually exclusive with LVDS
Ethernet Controller	Intel® i226LM/i226IT
Ethernet	Up to 2.5 GBASE-T with TSN support
Storage	2x SATA 6 Gb/s
Flash On-board	eMMC 5.1 option (up to 256 GByte TLC or 85 GByte pSLC)
PCI Express	4x PCIe lanes: 4x 1 / 2x 2 (PCIe Gen3) optional: 6x PCIe lanes w/o SATA-ports: 2 x2 / 1 x4 + 1 x2 / 2 x1 (PCIe Gen3, max 4 PCIe root ports optional: 6x PCIe lanes with Gen2 switch: 1 x2 / 2 x1 + 1 x2 / 2 x1 (PCIe Gen3) + 2 x1 (PCIe Gen2) - onboard i226 connected via PCIe Gen2 lane
USB	2x USB 3.2 Gen2 (incl. USB 2.0) + 6x USB 2.0 optional: 4x USB3.2 Gen2 w/ add USB-Hub
Serial	2x serial interface (RX/TX) from embedded controller; optional CAN instead of SER1
Audio	High Definition Audio interface
Other Features	GP_SPI, SMB, Fast I²C, Staged Watchdog, RTC
Special Features	Industrial grade temperature
Features on Request	eMMC5.1 - various capacities eDP instead of LVDS, DDI3: VGA 4x USB3.2 w/ add USB-Hub instead of 2x USB 3.2 General Purpose SPI instead of Boot SPI, discrete TPM 2.0, de-populated LAN 4x PCIe lanes w/o SATA-ports : 4x 1 / 2x 2 / 1x 4 6x PCIe lanes with PCIe switch: 4x 1 / 2x 2 / 1x 4 + 2x 1 / 1 x 2 2x UART from SOC instead of embedded controller KSC20 CAN instead of SER1
Power Management	ACPI 6.0
Power Supply	8.5 V – 20 V Wide Range, Single Supply Power
BIOS	AMI UEFI
Operating Systems	Linux, Windows 10/11 IoT Enterprise LTSC
Temperature	Commercial temperature: 0 °C to +60 °C operating, -30 °C to +85 °C non-operating Industrial temperature: -40 °C to +85 °C operating, -40 °C to +85 °C non-operating
Humidity	93 % relative Humidity at 40 °C, non-condensing (according to IEC 60068-2-78)

3.3.2. Block Diagram
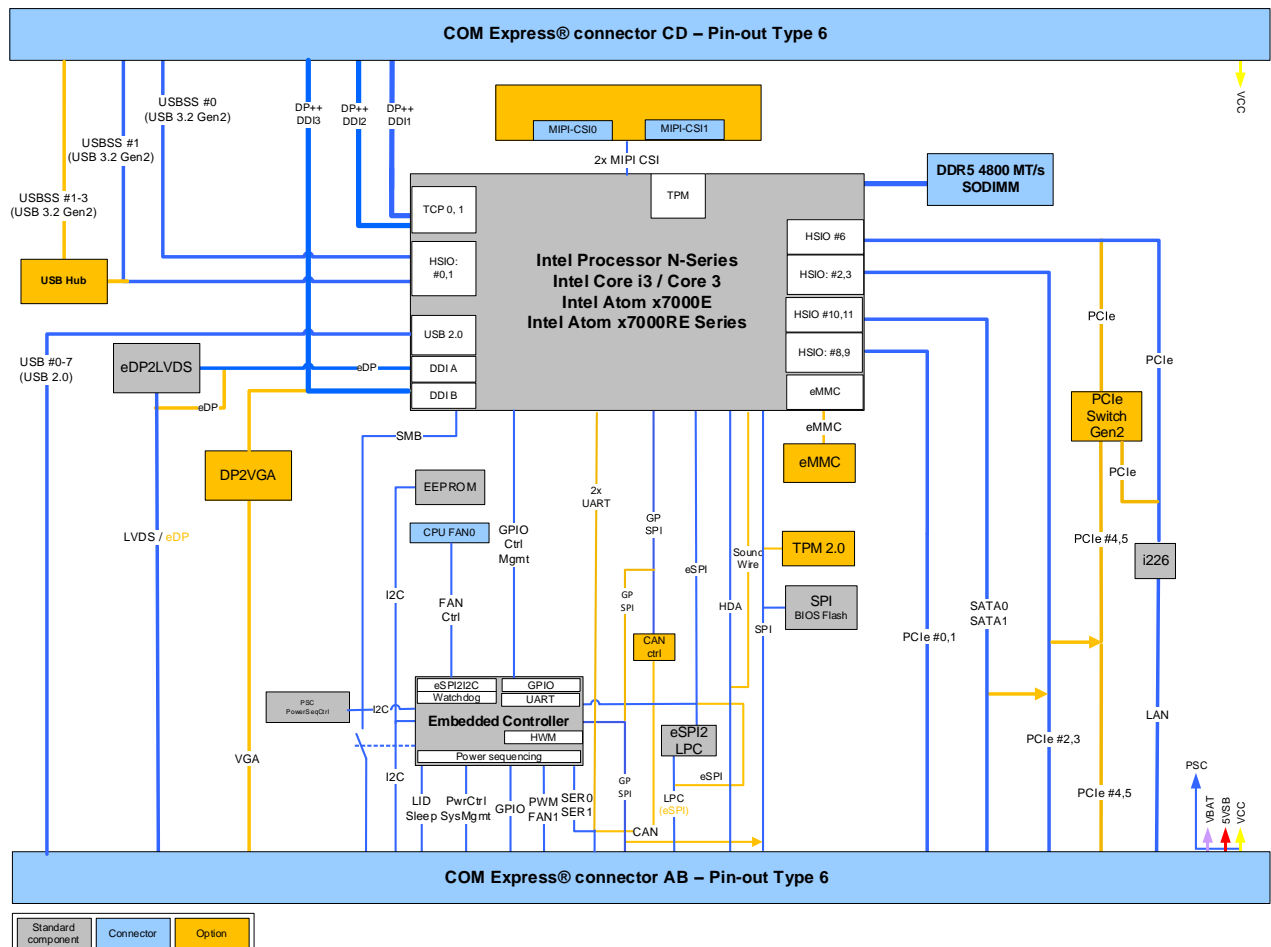
Figure 1: COMe-cAS6 (E2) Block Diagram

3.3.3. Top Side

Figure 2: COMe-cAS6 (E2) Front Side
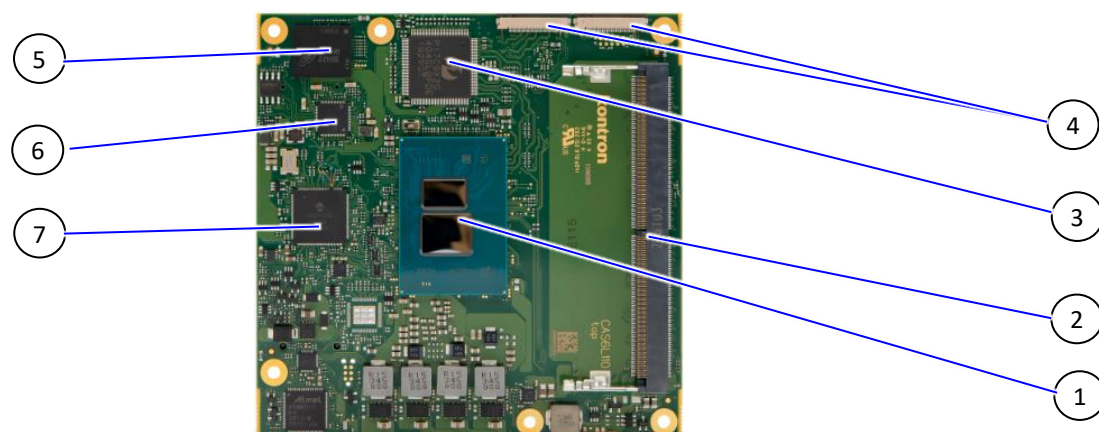
1. SoC - Processor (CPU) & Chipset (PCH)
2. SODIMM socket
3. PCIe Gen 2 switch (optional)
4. flatfoil connector for MIPI-CSI (optional)

5. eMMC flash chip (optional)
6. Ethernet controller
7. USB3.2 Gen 2 hub (optional)

3.3.4. Bottom Side

Figure 3: COMe-cAS6 (E2) Bottom Side

1. Embedded Controller

2. Four mounting holes - mounting heatspreader/module combination to carrier
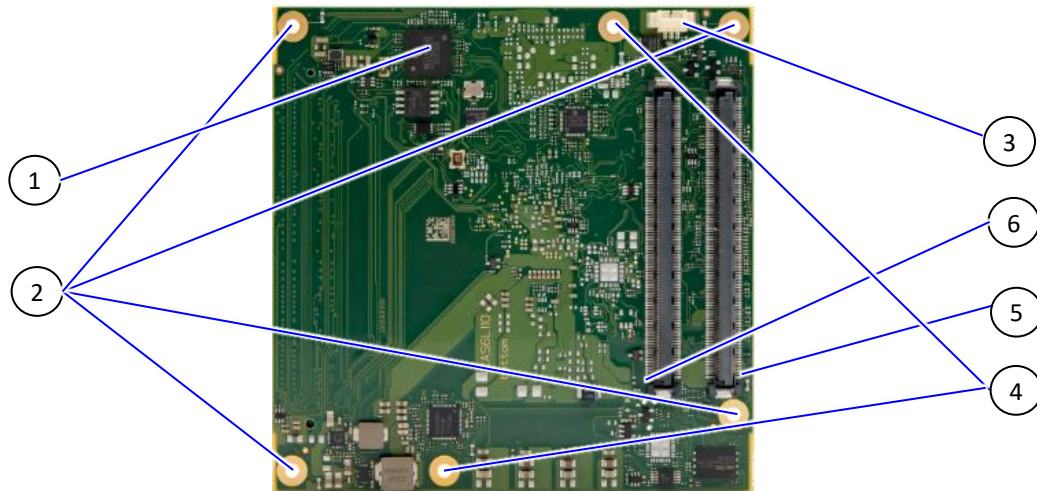
3. Fan connector

4. Two mounting holes - mounting cooling unit to heatspreader

5. COM Express connector J1 - Pin A1

6. COM Express connector J2 - Pin D1

3.3.5. Processor (CPU)

The processor series delivers power-efficient, ruggedized performance with up to eight Efficient-cores (E-cores), UHD Graphics driven by Xe architecture with up to 32 EUs. The processors supports Intel® Advanced Vector Extensions 2 (Intel® AVX2) and Intel® Deep Learning Boost (Intel® DL Boost) to accelerate compute-intensive operations and deep learning inference processing.

Table 9: Intel® Atom x7000RE Product Family Specifications - standard on COMe-cAS6 (E2)

Processor Number	TDP W	Cores	CPU			GPU			ECC In-Band	TCC	TJ min °C	Tj max °C	Use Condition
			Base GHz	1C Turbo GHz	MC Turbo GHz	EU	Base MHz	Turbo MHz					
x7211RE	6	2	1.0	3.2	2.9	16	400	1000	Yes	Yes	-40	105	Embedded Industrial
x7213RE	9	2	2.0	3.4	2.9	16	600	1000	Yes	Yes	-40	105	Embedded Industrial
x7433RE	9	4	1.5	3.4	2.7	32	600	1000	Yes	Yes	-40	105	Embedded Industrial
x7835RE	12	8	1.3	3.6	3.0	32	800	1200	Yes	Yes	-40	105	Embedded Industrial

Table 10: Intel® Atom x7000E Product Family Specifications - on request for COMe-cAS6 (E2)

Processor Number	TDP W	Cores	CPU			GPU			ECC In-Band	TCC	TJ min °C	Tj max °C	Use Condition
			Base GHz	1C Turbo GHz	MC Turbo GHz	EU	Base MHz	Turbo MHz					
x7211E	6	2	1.0	3.2	2.9	16	600	1000	Yes	Yes	0	105	Embedded
x7213E	10	2	2.0	3.4	2.9	16	600	1000	Yes	Yes	0	105	Embedded
x7425E	12	4	1.5	3.4	2.7	24	800	1000	Yes	Yes	0	105	Embedded

Table 11: Intel® Processor N-Series, Core i3, Core 3 Product Family Specifications - on request for COMe-cAS6 (E2)

Processor Number	TDP W	Cores	CPU			GPU			ECC In-Band	TCC	TJ min °C	Tj max °C	Use Condition
			Base GHz	1C Turbo GHz	MC Turbo GHz	EU	Base MHz	Turbo MHz					
N50	6	2	1.0	3.4	3.4	16	600	750	Yes	No	0	105	PC Client
N97	12	4	2.0	3.6	2.9	24	850	1200	Yes	No	0	105	PC Client
N150	6	4	0.8	3.6	2.9	24	400	1000	Yes	No	0	105	PC Client
N200	6	4	1.0	3.7	3.2	32	450	750	Yes	No	0	105	PC Client
N250	6	4	1.3	3.8	3.2	32	550	1250	Yes	No	0	105	PC Client
i3-N305	9/15	8	1.0/1.8	3.8	3.0	32	1000	1250	Yes	No	0	105	PC Client
N355	9/15	8	1.0/1.9	3.9	3.0	32	1000	1350	Yes	No	0	105	PC Client

For the processor families the Dynamic Temperature Range (DTR) behavior applies. DTR is the temperature range the processor can operate in. The temperature range starts with the temperature of the processor (Tj = junction temperature) at boot time (TBoot) and can transition to a lower and/or higher temperature within the Tj min and Tj max limits.

❯ E.g.: Tj min = -40°, the Tj max = 100°C and the DTR = +-90°C

❯ TBoot = -40°C: the processor can operate from -40°C up to + 50°C

❯ TBoot = -20°C: the processor can operate from -40°C up to + 70°C

❯ TBoot = +20°C: the processor can operate from -40°C up to + 100°C

A Tj outside of the DTR range requires a cold reset but is not enforced by the hardware.

The DTR behavior is described in Intel whitepaper 814861.

x7000RE Series:

When the turbo is enabled then the Use Condition is Embedded and the DTR = +- 90°C.

For use as Industrial Use Condition the turbo needs to be disabled, then DTR = +- 110°C.

In addition for certain interfaces such as eMMC, USB, etc.. the speed needs to be reduced.

x7000E Series:

Embedded Use Condition, DTR = +- 70°C.

Processor N-Series, Core i3, Core 3:

PC Client Use Condition, DTR = +- 70°C.

Please contact JUMPtec Support for further information or the COMe-cAS6 (E2) module needs to be set for Industrial Use Condition.

Table 12: DTR Table

CPU Use Condition	Commercial Temp: PC Client / Embedded	Extended Temp: Embedded	Extended Temp: Industrial
CPU Tj min.	0°C	-40°C	-40°C
CPU Tj max.	105°C	105°C	105°C
DTR (Cold to Hot Transition)	TBoot + 70°C	TBoot + 90°C	TBoot + 110°C
DTR (Hot to Cold Transition)	TBoot - 70°C	TBoot - 90°C	TBoot - 110°C

3.3.6. Plattform Controller Hub (PCH)

The processor series supports an integrated PCH offering interfaces such as 9 HSIOs (High Speed IO lanes)

3.3.7. System Memory

The COMe-cAS6 (E2) supports up to 16 GByte DDR5-SODIMMs (4800MT/s).
The processor series supports in-band ECC.

3.3.8. High-Speed IO - HSIO Mapping

The integrated SoC PCH supports 9x HSIO lanes, which can be configured as PCIe Gen 3.0 lanes with a max of 5 RPC (Root Port Controller).
Partially the HSIOs are multi-pupose and can be alternatively configured as USB3.2 Gen2 or SATA.

Table 13: Processor's HSIOs

Processor's HSIO #												
0	1	2	3				6		8	9	10	11
USB SuperSpeed												
0	1	2	3									
PCIe							PCIe		PCIe			
x1	x1	x1	x1				x1		x1	x1	x1	x1
							TSN LAN				SATA	
											0	1

Table 14: Processor's HSIOs mapping to COMe-cAS6 (E2) interfaces

HSIO Default	0	1	10	11	8	9	2	3			6
	COMe USB3 #0	COMe USB3 #1	COMe SATA #0	COMe SATA #1	COMe PCIe #0	COMe PCIe #1	COMe PCIe #2	COMe PCIe #3	COMe PCIe #4	COMe PCIe #5	onboard LAN / i226

HSIO Option	0	1	10	11	8	9	2	3			6
								Switch Gen2			
	COMe USB3 #0	COMe USB3 #1	COMe SATA #0	COMe SATA #1	COMe PCIe #0	COMe PCIe #1	COMe PCIe #2	COMe PCIe #3	COMe PCIe #4	COMe PCIe #5	onboard LAN / i226

HSIO Option	0	1			8	9	10	11	2	3	6
	COMe USB3 #0	COMe USB3 #1	COMe SATA #0	COMe SATA #1	COMe PCIe #0	COMe PCIe #1	COMe PCIe #2	COMe PCIe #3	COMe PCIe #4	COMe PCIe #5	onboard LAN / i226

HSIO Option	0	1	10	11	8	9			2	3	6
	COMe USB3 #0	COMe USB3 #1	COMe SATA #0	COMe SATA #1	COMe PCIe #0	COMe PCIe #1	COMe PCIe #2	COMe PCIe #3	COMe PCIe #4	COMe PCIe #5	onboard LAN / i226

3.4. Interfaces

3.4.1. PCI Express Lanes

The COMe-cAS6 (E2) supports four PCI Express Gen3 lanes PCIe [0-3] on default and up to six PCI Express lanes PCIe [0-5] on request, allowing for the connection of up to six (depending on the configuration) separate external PCIe devices.
The default PCIe configuration is 4x PCIe Gen3 lanes (4 x1) with options for (2 x1 + 1 x2), (2 x2).
On request available is:
6x PCIe Gen3 lanes w/o SATA connectivity or
4x PCIe Gen4 lanes + 2x PCIe Gen2 lanes with an PCIe Gen2 switch.

See also Chapter 3.3.8 HSIO Mapping

Table 15: PCI Express default - with SATA support

COMe Connector	Supported Lane Configuration		
	4 x1 (default)	2 x1 + 1 x2	2 x2
PCIE_0 Gen3	x1	x2	x2
PCIE_1 Gen3	x1		
PCIE_2 Gen3	x1	x1	x2
PCIE_3 Gen3	x1	x1	

> **i** To change the default PCIe configuration (4x1), a different BIOS version is required. For BIOS version information, please visit JUMPtec's Customer Section.

Table 16: PCI Express option - no SATA support

COMe Connector	Possible Lane Configurations		
PCIE_0 Gen3	x1	x2	x4
PCIE_1 Gen3	x1		
PCIE_2 Gen3	x1	x2	
PCIE_3 Gen3	x1		
PCIE_4 Gen3	x1	x2	
PCIE_5 Gen3	x1		

> **i** A maximum of 5 PCIe root ports is supported by the processor. The onboard ethernet controller i226 - connected via PCIe Gen3 x1 - needs to be taken into account as well.

Table 17: PCI Express option - with additional PCIe Gen2 switch

COMe Connector	Possible Lane Configurations	
PCIE_0 Gen3	x1	x2
PCIE_1 Gen3	x1	
PCIE_2 Gen3	x1	x2
PCIE_3 Gen3	x1	
PCIE_4 Gen2	x1	x2
PCIE_5 Gen2	x1	

> **i** The onboard ethernet controller i226 ist connected via PCIe Gen2 x1 routed from the PCI Gen2 switch.

Table 18: PCI Express option - with SATA support

COMe Connector	Possible Lane Configurations	
PCIE_0 Gen3	x1	x2
PCIE_1 Gen3	x1	
PCIE_4 Gen2	x1	x2
PCIE_5 Gen2	x1	

3.4.2. USB

The COMe-cAS6 (E2) supports eight USB 2.0 ports and up to four of these can be used as USB 3.2 Gen1 or Gen2 ports. Each USB 3.2 port implemented is comprised of a USB 2.0 port and an USB SuperSpeed TX pair and RX pair. Therefore, the number of available USB 2.0 only ports decreases with every used USB 3.2 Gen1 or Gen2 port.

The COMe-cAS6 (E2) supports two USB 3.2 Gen2 ports with up to 10 Gb/s (including USB 2.0) and six dedicated USB 2.0 ports.

On request up to four USB 3.2 Gen2 are possible, by routing USB _SS1 to the USB 3.2 hub to output three USB 3.2 Gen 2 (10Gb/s) ports. As a result, the number of dedicated USB 2.0 ports is reduced to 4x USB 2.0.

USB Ports	Default: 2x USB 3.2 Gen2 (up to 10 Gb/s), 6x dedicated USB 2.0
	Option: 4x USB 3.2 Gen2 (up to 10 Gb/s), 4x dedicated USB 2.0 with onboard USB-hub
USB Over Current Signals	4x

Table 19: USB 3.2 Gen2 / USB 2.0

COMe Connector	PCH HSIO	Description
USB_SS1	HSIO #0	USB 3.2 Gen2 (10 Gb/s)
USB_SS2	HSIO #1	USB 3.2 Gen2 (10 Gb/s)

COMe Connector	PCH USB Port	Description
USB0	USB2_0	USB 2.0 port
USB1	USB2_1	USB 2.0 port
USB2	USB2_2	USB 2.0 port
USB3	USB2_3	USB 2.0 port
USB4	USB2_4	USB 2.0 port
USB5	USB2_5	USB 2.0 port
USB6	USB2_6	USB 2.0 port
USB7	USB2_7	USB 2.0 port

> **i** When designing the carrier board consider the speed of the USB 3.2 Gen2 (10 Gb/s). JUMPtec recommends using a retimer/redriver on the carrier.

3.4.3. SATA

The COMe-cAS6 (E2) offers two SATA Gen3 ports with 6 Gb/s. (see also Chapter 3.3.8 HSIO Mapping):

Table 20: SATA Port Connections

COMe Connector	PCH HSIO	Description
SATA0	HSIO #10	SATA Gen3, 6 Gb/s
SATA1	HSIO #11	SATA Gen3, 6 Gb/s

3.4.4. Ethernet

The COMe-cAS6 (E2) supports one 2.5GBASE-T port.
HSIO lane #6 of the integrated SOC PCH is used as PCIe x1 lane for the onboard 2.5GbE ethernet controller i226 (see
Chapter 3.3.8 HSIO Mapping).

3.4.5. Graphics Interface

COM Express® Type 6 boards can support up to three Digital Display Interfaces (DDI) to provide DisplayPort and
HDMI/DVI modes, a single or dual channel 18/24 bit LVDS panel interface and an eDP overlayed on LVDS Channel A.
The manner in which LVDS or eDP operation is chosen is vendor dependent.

The COMe-cAS6 (E2) processor graphics is based on Generation 12 graphics core architecture. The Gen12
architecture supports up to 32 Execution Units (EUs) depending on the processor SKU.
The processor supports three simultaneous displays (Pipes A, B, C) with:

- › Up to 1x 4kp60 + 2x 1080p60 display concurrent
- › Up to 2x 4K60 HDR

Processor	COMe Port	
DDI A	LVDS resolution up to 1920x1200 in dual channel mode	option: eDP, mutually exclusive with LVDS
TCP 0	DDI1 (DP++) max resolution 4096x2304 @60Hz for a resolution >4K a re-timer/re-driver is required on the carrier	
TCP 1	DDI2 (DP++) max resolution 4096x2304 @60Hz for a resolution >4K a re-timer/re-driver is required on the carrier	
DDI B	DDI3 (DP++) max resolution 4096x2304 @60Hz for a resolution >4K a re-timer/re-driver is required on the carrier	option: VGA, mutually exclusive with DDI3

> JUMPtec strongly recommends the use of flat panels that support Extended Display
> Identification data (EDID) when connecting to the LVDS interface.
> An external LVDS EEPROM can be connected to the LVDS_I2C bus at COMe connector pins
> A83 and A84. Don´t connect other devices to this bus.

3.4.6. Audio Interface

The HDA signals of the processor are passed directly to COMe connector.
SoundWire connections are optionally available according to the COM.0 Rev3.1 specification.

3.4.7. UART

Two 3.3V logic level asynchronous two-wire serial ports, designated as SER0 and SER1 are defined by COM Express®
Type 6 modules.
By default both serial ports are provided by the embedded controller. The module offers two additional connections
to COMe serial port pins from the processor via resistor stuffing option:

1. UARTs from Embedded Controller
2. Optional UARTs provided by the processor
3. Optional CAN interface - either SER0 or SER1 - CAN TX/RX for one single instance of a UART port only)

Hardware handshaking and hardware flow control are not supported.
The module asynchronous serial ports are intended for general purpose use and for use with debugging software that
make use of the "console redirect" features available in many operating systems.

Table 21: UART interfaces

COMe Signal	Embedded Controller (default)	PCH (optional)	MCP2518FD (optional)
SER0_TX	UART0_TX	GPP_H11 / UART0_TDX	CAN_TX
SER0_RX	UART0_RX	GPP_H10 / UART0_RDX	CAN_RX
SER1_TX	UART1_TX	GPP_D18 / UART1_TDX	CAN_TX
SER1_RX	UART1_RX	GPP_D17 / UART1_RDX	CAN_RX

3.4.8. CAN

A CAN interface is available on request via populating the Microchip MCP2518FD CAN controller.
(see Chapter 3.4.7)

3.4.9. General Purpose SPI Interface - GP_SPI

The COM Express® specification Rev. 3.1 introduces a General Purpose Serial Peripheral Interface (GP_SPI) with dedicated pins (using RSVD pins of the former pinout) to connect multiple peripherals.
The GP_SPI signals are provided by the onboard embedded controller. As an assembly option the GP_SPI signals can be sourced alternatively from the PCH.
To maintain backward compatibility to predecessor designs, it's possible to connect the GP_SPI interface to COMe SPI pins via an assembly option as well.

Table 22: GP-SPI

COMe Signal	Optional COMe Signal
GP_SPI_CS# (A55)	SPI_CS# (B97)
GP_SPI_MISO (B55)	SPI_MISO (A92)
GP_SPI_MOSI (B56)	SPI_MOSI (A95)
GP_SPI_CK (A56)	SPI_CLK (A94)

3.4.10. Boot SPI Interface

The processor's SPI0 interface is connecting to the onboard 32MB SPI flash and an optional TPM chip and further routed to the COMe SPI pins. This interface supports serial flash (for BIOS firmware) and TPM being attached to it only.
A BOM assembly option allows the General Purpose SPI (GP_SPI) to be connected to COMe signal pins instead. This option is implemented on request only.

Table 23: SPI

COMe Signal	PCH Pin (default)	PCH Pin (GP SPI option)
SPI_CS#	See table below	GPP_E10 / THC0_SPI1_CS# / GSPI0_CS0#
SPI_MISO	SPI0_MISO_IO0	GPP_E12 / THC0_SPI1_IO1 / I2C0A_SDA / SPI0_MISO
SPI_MOSI	SPI0_MOSI_IO1	GPP_E13 / THC0_SPI1_IO0 / I2C0A_SCL / GSPI0_MOSI
SPI_CLK	SPI0_CLK	GPP_E11 / THC0_SPI1_CLK / GSPI0_CLK
SPI_POWER	Connected to V_3V3_S5	
BIOS_DIS0#	Embedded Controller input to control SPI_CS# logic	
BIOS_DIS1#	Embedded Controller input to control SPI_CS# logic	

The COMe-cAS6 (E2) module supports on-module and carrier boot from SPI. The processor platform does not support Slave Attached File Scharing (SAFS) configurations (i.e. BIOS can't be attached to eSPI via an EC/BMC).
COMe signals BIOS_DIS0#, BIOS_DIS1# and ESPI_EN# are used to select the desired boot source (see table below).

Config #	ESPI_EN#	BIOS_DIS1#	BIOS_DIS0#	Boot Bus	PCH CS1# (FSPI_CS1_N) to…	PCH CS0# (FSPI_CS0_N) to…	CS# to COMe Carrier	SPI Descriptor	Description
1	1	0	0	SPI	Carrier	Module	PCH CS1#	Module	MAFS on Module / LPC enabled
2	1	0	1	SPI	Module	Carrier	PCH CS0#	Carrier	MAFS on Carrier / LPC enabled
3	1	1	0	-	-	-	-	-	Not used – was FWH (works like #4)

4	1	1	1	SPI	Module	Module	High	Module	MAFS on Module / LPC enabled
5	0	0	0	SPI	Carrier	Module	PCH CS1#	Module	MAFS on Module / eSPI enabled
6	0	0	1	SPI	Module	Carrier	PCH CS0#	Carrier	MAFS on Carrier / eSPI enabled
7	0	1	0	eSPI	-	-	-	-	COMe-cAS6 (E2) does not support SAFS configurations (work like #5)
8	0	1	1	eSPI	-	-	-	-	

> If ESPI_EN# selection of the carrier does not match the module configuration (eSPI/LPC) the module won't boot.

3.4.11. LPC/eSPI

The Low Pin Count (LPC) interface is pin shared with eSPI. A COM Express® module design may support either LPC or eSPI or both.
As LPC isn't provided by the processor platform an eSPI-to-LPC bridge is implemented on the COMe-cAS6 (E2) per default.
ESPI_EN# is available for the carrier to signal to the module whether LPC or eSPI is to be used.

› If ESPI_EN# is unconnected on the carrier, LPC operation is expected.

› For eSPI operation ESPI_EN# has to be connected to GND on the carrier.

To be able to detect the correct mode of operation, the module uses a pull-up resistor on this signal.

> The module will not boot up if module and carrier configuration do not match.

Table 24: LPC/eSPI mode comparison

COMe Connector Pin	LPC mode (eSPI-to-LPC bridge)	eSPI mode (PCH)
LPC_AD[0:3]/ESPI_IO_[0:3]	LAD[0:3]	ESPI_IO_[0:3]
LPC_FRAME#/ESPI_CS0#	LFRAME#	ESPI_CS0#
LPC_CLK/ESPI_CK	LPC_CLK0	ESPI_CLK
LPC_DRQ[0:1]#/ESPI_ALERT[0:1]#	LPC_DRQ[0:1]	ESPI_ALERT[0:1]#
LPC_SERIRQ/ESPI_CS1#	SER_IRQ	ESPI_CS1#
SUS_STAT#/ESPI_RESET#	SUS_STAT#	ESPI_RESET#
ESPI_EN#	ESPI_EN#	

> For eSPI usage a HW modification and customized BIOS according to the customer's requirements is necessary. For further help on this please contact JUMPtec Support.

3.4.12. I2C

The I2C buses are managed by the onboard Embedded Controller.
The external I2C bus transfers data between I2C devices connected on the bus, a further internal one between components on the module itself.

The Fast I2C bus transfers data with rates up to 400 kHz. To change the I2C bus speed in the BIOS setup menu select:
Advanced>Miscellaneous>I2C Speed> 1 kHz to 400 kHz
The default speed is 200 kHz.

External user-accessible I2C (I2C_EXT)
The following table specifies the devices connected to the accessible I2C bus including the I2C address. This I2C bus is available at COMe connector pins I2C_CK, I2C_DAT.

Table 25: I2C Bus Port Address (I2C_EXT)

8-bit address	7-bit address	Device
0xA0	0x50	Module Embedded EEPROM
0xAE	0x57	Carrier EEPROM (optional)

Internal I2C (I2C_INT)

The second I2C bus is primarily used for configuration of onboard devices, such as the LVDS bridge, but also for an external LVDS EEPROM.

3.4.13. GPIO

The COMe-cAS6 (E2) offers eight GPIOs, generated by the onboard embedded controller.
The type of termination resistor used defines the direction of the GPIO; GPIs are terminated by pull-up resistors, and GPOs are terminated by pull-down resistors.
Due to the fact that both the pull-up and pull-down termination resistors are weak, it is possible to override the termination resistors using external pull-ups, pull-downs or IOs. Overriding the termination resistors means that the eight GPIO pins can be considered as bi-directional since there are no restrictions whether you use the available GPIO pins in the in- or out-direction.
Configuration can be adjusted by the OS driver.

3.4.14. SMB

The System Management Bus (SMBus) is a simple 2-wire bus for low-speed system management communication. The (On-Package) PCH controls the SMBus.
The 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

Table 26: SMBus Address

8-bit Address	7-bit Address	Device
tbd	tbd	Embedded Controller KSC20
tbd	tbd	PCIe Gen2 switch

3.4.15. MIPI-CSI

Two MIPI-CSI interfaces are available on request.The interfaces are made available via 2 additional connectors on the top side of the module.

Table 27: MIPI-CSI Port 0

MIPI CSI Connector Pin	MIPI CSI Pin Name	Processor
4/5, 7/8, 10/11, 13/14	CSI0_RX[0:3]±	CSI_B_DP/N[0:3]
16/17	CSI0_CK±	CSI_B_CLK_P/N
19	I2C_CAM0_CK	GPP_H7
20	I2C_CAM0_DAT	GPP_H6
21	CAMx_PWR#	GPP_A21
12	CAMx_RST#	GPP_A11
22	CAM0_MC	GPP_H20/IMGCLKOUT1
1,2	CAM0_VCC	Connected to 3V3_S0
3, 6, 9, 15, 18	GND	Connected to GND

Table 28: MIPI-CSI Port 1

MIPI CSI Connector Pin	MIPI CSI Pin Name	Processor
4/5, 7/8, 10/11, 13/14	CSI1_RX[0:3]±	CSI_C_DP/N[0:3]
16/17	CSI1_CK±	CSI_C_CLK_P/N
19	I2C_CAM1_CK	GPP_B17
20	I2C_CAM1_DAT	GPP_B16
21	CAM1_PWR#	GPP_A22
12	CAM1_RST#	GPP_A13
22	CAM1_MC	GPP_H21/IMGCLKOUT2
1,2	CAM1_VCC	Connected to 3V3_S0
3, 6, 9, 15, 18	GND	Connected to GND

i

The MIPI-CSI ports have been tested as proof-of-concept with the camera module LI-IMX415-MIPI-081H and adapter card LI-FPC22-IPEX-ONX from Leopard Imaging.

For further information please contact JUMPtec Support.

3.5. Features

3.5.1. ACPI Power States

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

Table 29: ACPI Power States Function

S0	Working state
S1	Sleep (typically not supported anymore)
S2	Deep Sleep (typically not supported anymore)
S3	Suspend-to-RAM
S4	Suspend-to-disk / Hibernate
S5	Soft-off state

i

Not all ACPI defined power states are available.
The COMe-cAS6 (E2) supports ACPI 6.0 and the power states S0, S3, S4, S5.

i

To power on from state S3, S4, S5 use: Power Button, Wake On LAN

3.5.2. Embedded Controller - Hardware Monitor

The Embedded Controller (EC) together with the Power Sequence Controller (PSC) provides a broad set of functionality:

› power sequencing control

› monitoring the module's processor temperature, power supply voltages V_IN_VAR, VCC_5V_SBY, VCC_RTC

› monitoring and configuring the on-board and external fans

› acting as hub or super-IO for low speed interfaces such as UART, I2C/SMB, GP_SPI, GPIO

› supporting watchdog functions

The EC is accessible through the API in the Board Support Package.

3.5.3. Trusted Platform Module

The COMe-cAS6 (E2) supports the firmware TPM (fTPM) using the integrated TPM 2.0 capability of the Intel Platform Trusted Technology (Intel® PTT). On request a dicrete TPM chip can be offered which is directly connected to the dedicated SPI interface from the PCH.

3.5.4. Watchdog

The COMe-cAS6 (E2) supports an independently programmable dual-stage software watchdog timer.
The watchdog functionality is accessible through the API of the Embedded Controller (EC) in the related Board Support Package. The watchdog is able to generate IRQ (SWI), SMI and SCI dependent on the implementation.

Please find more information about the watchdog implementation in the according API user guide for the EC implementation.

Time-out event	Description

No action	Stage is off and will be skipped
Reset	Restarts the module and starts a new POST and operating system
NMI	A non-maskable interrupt (NMI) is a computer processor interrupt that cannot be ignored by standard interrupt masking techniques in the system. It is used typically to signal attention for non-recoverable hardware errors.
SMI	A system management interrupt (SMI) makes the processor entering the system management mode (SMM). As such, specific BIOS code handles the interrupt. The current BIOS handler for the watchdog SMI currently does nothing. For special requirements, contact JUMPtec Support.
SCI	A system control interrupt (SCI) is a OS-visible interrupt to be handled by the OS using AML code
Delay	Might be necessary when an operating system must be started and the time for the first trigger pulse must be extended.

The software watchdog functionality can be combined with enabling/disabling the activity of the COMe WDT watchdog signal pin.

Table 30: Watchdog signal on COMe connector

COMe	EC	Description
WDT - Pin B27	B6	Generated by Embedded Controller.

3.5.5. Real-Time Clock (RTC)

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.
The COMe-cAS6 (E2) supports typical RTC values of 3 V and less than 10 µA. When powered by the main power supply on-module regulators generate the RTC voltage, to reduce RTC current draw.

> **i** The input range at VCC_RTC is 2.5 – 3.3V (the COM Express specification COM.0 R3.1 defines an input range of 2.0 – 3.3 V).

> **i** It is not recommended to run a system without a RTC battery on the carrier board. Even if the RTC battery is not required to keep the actual time and date when main power is off, a missing RTC battery will cause other side effects such as longer boot times. Intel processor environments are generally designed to rely on RTC battery voltage.

3.5.6. eMMC

As BOM option an eMMC (Embedded Multimedia Flash Card) can be populated on the COMe-cAS6 (E2). The eMMC is eMMC 5.1 compatible.
eMMCs are available as MLC = Multi-Level-Cell or TLC = Triple-Level-Cell.
In order to improve reliability, endurance and performance eMMCs can be re-configured as pSLCs = pseudo Single-Level-Cell.
eMMCs are available with a maximum capacity of 256GB as TLC.
Reconfiguring to pSLC reduces the eMMC capacity.

The standard COMe-cAS6 E2 variants support TLC eMMC.
On request, other eMMC capacities or configurations can be offered.

> **i** Pseudo SLC (pSLC) memory is a reconfigured MLC/TLC eMMC.
> MLC to pSLC: the capacity is half of a MLC memory.
> TLC to pSLC: the capacity is a third of the TLC memory.

3.5.7. Boot SPI Device

A 32 MByte SPI Flash device supporting SFDP (Serial Flash Discovery Parameter) is attached to the PCH FSPI interface (dedicated SPI interface from On-Package PCH for TPM and flash memory). Flash Descriptor, BIOS, converged security engine as well as platform data are stored within the SPI Flash. The SPI interface is routed to the COM Express connector (see Chapter 3.4.9)
Following Flash Devices are supported by the BIOS:

Table 31: Supported SPI Flash Devices

Size	Manufacturer	Part Number	Package Type
32 MByte	Macronix	MX25L25645GZ2I-08G	WSON-8
32 MByte	Micron	MT25QL256ABA1EW9-0SIT	WSON-8
32 MByte	Winbond	W25Q256JVEIQ	WSON-8
32 MByte	Cypress	S25FL256LAGNFI010	WSON-8

3.5.8. Embedded EEPROM

The module's 32 kbit serial EEPROM (formerly known as JIDA EEPROM) device is attached to the I2C bus (I2C_EXT) from the Embedded Controller and accessible via I2C bus 8-bit address 0xA0 (see Chapter 3.4.11).
The module EEPROM contains a reserved area in which LVDS panel timing parameters can be stored. This area can be programmed with the tool LFP_EEP.EFI (available on JUMPtec's Customer Section). Additional information is available in the Application Note "IGD Configuration".

3.5.9. Features on Request

For the COMe-cAS6 (E2) following optional features are available on request:

Table 32: Features on Request

Optional Features (on request)	
CPU	N-Series, Core i3, Core 3, x7000E-Series
eMMC 5.1	Up to 256GB eMMC 5.1 Flash TLC technology - configuration as pSLC can be offered
TPM	Discrete TPM 2.0 chip
eDP	Support of eDP instead of LVDS
VGA	Support of VGA instead of DDI3
eSPI	Instead of LPC signals, eSPI signals are routed to the according pins of the COMe connector
UART	SER0/1: 2 UART serial RX/TX ports from SOC (PCIe based, non-legacy) instead of Embedded Controller
CAN	CAN-interface instead of SER1
GP-SPI	Signals routed to SPI pins of COMe connector
MIPI-CSI	2x MIPI-CSI connectors

3.6. Electrical Specification

The module powers on by connecting to a carrier board via the COM-Express interface connectors.
The COM Express interface connector pins on the module limit the amount of power received.

⚠CAUTION	Before connecting the module's interface connector to the carrier board's corresponding connector, ensure that the carrier board is switched 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

3.6.1. Power Supply Specification

The power specification of the module supports a single supply voltage of 12 V and a wide input voltage range of 8.5 V to 20 V. Other supported voltages are 5 V standby and 3 V RTC battery input.

Table 23: Power Supply Specification

Supply Voltage range (VCC)	8.5 V to 20 V
Supply Voltage (VCC)	12 V ± 5%
Standby Voltage (VCC_5V_SBY)	5 V ± 5% - Note: Standby voltage is not mandatory for operation
RTC Voltage (VCC_RTC)	2.5 V to 3.3 V

⚠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.

ℹ	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.

ℹ	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.

3.6.1.1. 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.

3.6.1.2. 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.

3.6.1.3. 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.

3.6.2. Power Management

The Advanced Configuration and Power Interface (ACPI) 5.0 hardware specification supports features such as power button and suspend states. The power management options are available within the BIOS set up menu: **Advanced>ACPI Settings>**

3.6.2.1. Suspend States

If power is removed, 5V can be applied to the V_5V_SBY pins to support the ACPI suspend-states:

❱ Suspend to RAM (S3)

❱ Suspend to Disk (S4)

❱ Soft-off (S5)

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

3.6.2.2. Power Supply Control Signals

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

Table 33: Power Supply Control Signals

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 (VIN_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.
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 CB_Reset# from module to carrier is active low, the module outputs a request to the carrier board to reset.
SMBus Alert (SMB_ALERT#)	B15	System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system. It may be useful for implementation on the Carrier Board of standards such as Smart Battery. When an external battery manager is present and SMB_ALERT# connected, the module powers on even if the BIOS switch "After Power Fail" is set to "Stay Off".
Battery Low (BATLOW#)	A11	BATLOW# indicates that the external battery is low and provides a batterylow signal to the module for orderly transitioning to power saving or power cut-off ACPI modes
PCIe Wake UP (WAKE0#)	B66	PCI Express wake up signal.
GP Wake UP (WAKE1#)	B67	General purpose wake up signal. May be used to implement wake-up on PS2 keyboard or mouse activity.
Suspend Control (SUS_STAT#)	B18	SUS_STAT# indicates an imminent suspend operation. Used to notify LPC devices.
Suspend to RAM (SUS_S3#)	A15	Indicates system is in Suspend-to-RAM state. Active low output.
Suspend to Disk (SUS_S4#)	A18	Indicates system is in Suspend-to-disk state. Active low output.
Soft-off (SUS_S5#)	A24	Indicates system is in Soft-off state. Active low output.
Lid detection (LID#)	A103	LID switch: Low active signal used by the ACPI operating system for a LID switch.
Sleep button (SLEEP#)	B103	Sleep button: Low active signal used by the ACPI operating system to bring the system to sleep state or to wake it up again.

3.6.3. Power Supply Modes

The COMe-cAS6 (E2) is operating in either ATX power mode or single power supply mode.

3.6.3.1. ATX Power Supply Mode

To start the module in ATX mode, connect VCC and 5V Standby from a ATX PSU. As soon as the standby rail ramps up the PCH 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 PCH continues the transition to S0.

> The input voltage must always be higher than 5 V standby (VCC>5VSB) for modules supporting a wide input voltage range down to 8.5 V.

Table 34: 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.

3.6.3.2. 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 35: 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]
G3 → S0	high	open/high	open	VCC
S0 → S5	PWRBTN or Sleep Event	open/high	open	VCC
S5 → S0	PWRBTN or Wake Event	open/high	open	VCC
S0 -> G3	0V/ X[1]	0V/ X[1]	0V/ X[1]	0V/ X[1]

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

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

3.7. Thermal Management

3.7.1. Heatspreader Plate Assembly

A heatspreader plate assembly is available from JUMPtec for the COMe-cAS6 (E2).
The heatspreader plate assembly is NOT a heat sink. The heatspreader plate transfers heat as quickly as possible from the processor using a copper core positioned directly above the processor and a Thermal Interface Material (TIM).
The heatspreader plate is factory prepared with a TIM screen printed on the contacts and may be fasten to the module without additional user actions.
The heatspreader plate works as a COM Express standard thermal interface and must be used with a heat sink or external cooling devices 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 the module's specification:

- ❯ 60°C for commercial temperature grade modules
- ❯ 75°C for extended temperature grade modules (E1)
- ❯ 85°C for industrial temperature grade modules (E2)

3.7.2. 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 application and environmental conditions. JUMPtec'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.

3.7.3. Operating with 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 36: Heatspreader Temperature Specification

Temperature Grade	Requirements
Commercial Grade	at 60°C HSP temperature on MCP @100% load; needs to run at nominal frequency
Extended Grade(E1)	at 75°C HSP temperature the MCP @ 75% load; is allowed to start throttling for thermal protection
Industrial Grade (E2)	at 85°C HSP temperature the MCP @ 50% load; is allowed to start throttling for thermal protection

3.7.4. Operating without Heatspreader Plate (HSP) Assembly

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

3.7.5. Temperature Sensors

The modules's processor is capable of reading its internal temperature. The embedded controller EC (uses an on-chip temperature sensor to measure the module's temperature on the board.
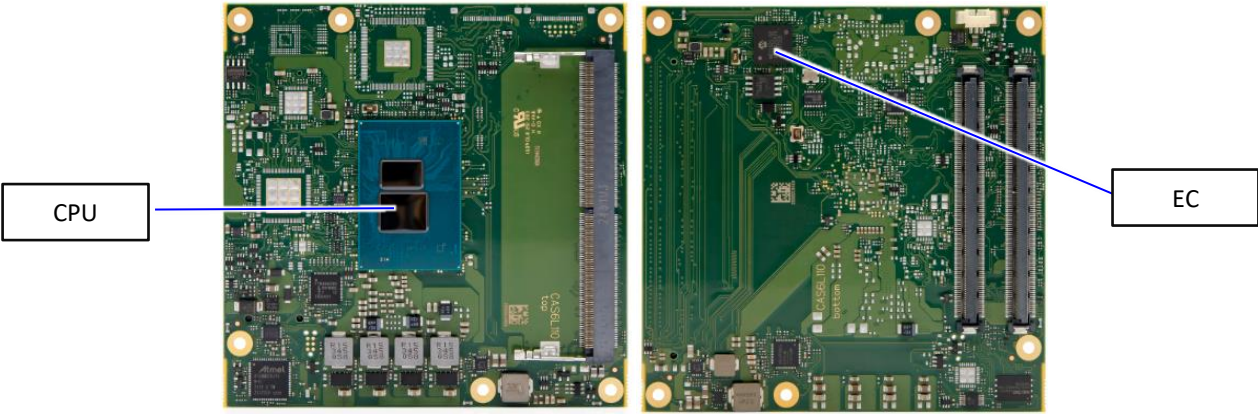
Figure 4: Module Temperature Sensors

3.7.6. On-Module Fan Connector

The module's fan connector powers, controls and monitors an external fan. To connect a standard 3-pin connector fan to the module, use JUMPtec's fan cables:

› KAB-HSP 200 mm (96079-0000-00-0)

› KAB-HSP 400 mm (96079-0000-00-2)

Position of the fan connector see Chapter 3.3.4

The analog output voltage on this connector is generated via a discrete linear voltage regulator from the PWM signal of the HWM. It is clipped at 12 V (+/- 10 %) across the whole input range of the module to prevent fan damage at higher voltages.
The maximum supply current to the fan is 350 mA if the input voltage is below 13 V and is further limited to 150 mA if the input voltage to the module is between 13 V and 20 V.

Table 37: 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

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

3.8. Mechanical Specification

3.8.1. Module Dimensions

The COMe compact module dimensions are 95 mm x 95 mm (3.7" x 3.7").
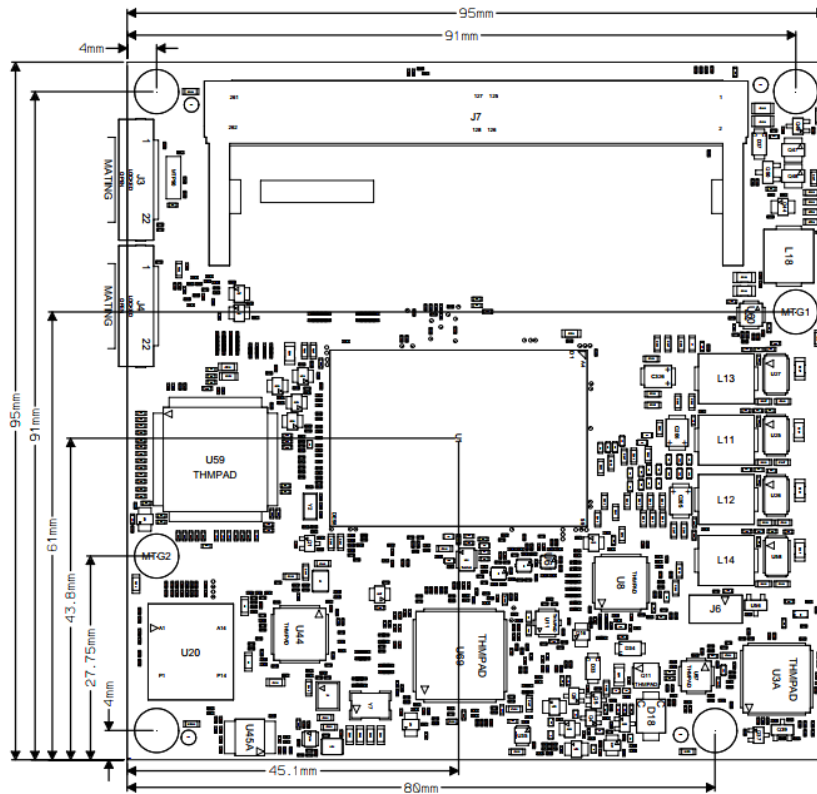
Figure 5: Module Dimensions

3.8.2. Module Height

The COM Express® specification defines a module height of approximatly 13mm, when measured from the bottom of the module's PCB board to the top of the heatspreader. The overall height of the module and carrier board depends on:

❯ which carrier board connectors are used (5mm and 8mm height are available)

❯ which cooling solution is used. The height of the cooling solution is not specified in the COM Express specification
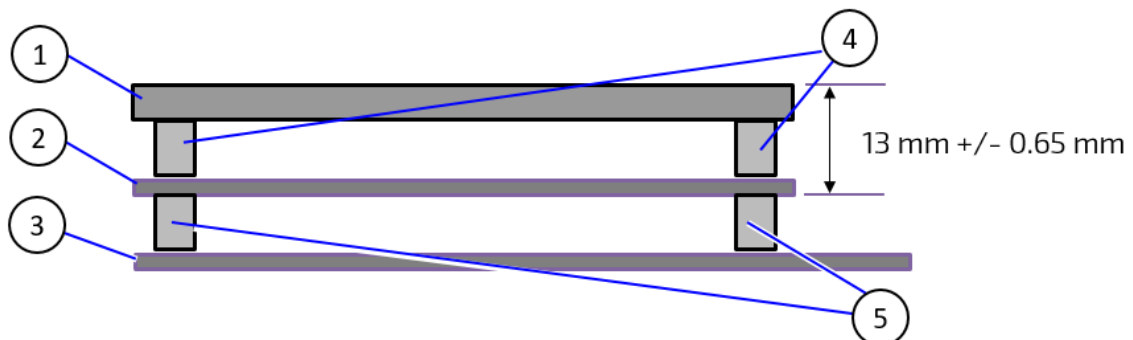
1	Heatspreader	4	Heatspreader standoff(s)
2	Module PCB board	5	Connector standoff(s) 5 mm or 8 mm
3	Carrier PCB board		

Figure 6: Module and Carrier Height with 5 and 8mm connector height

3.8.3. Heatspreader Plate Assembly Dimension

Please check our Customer Section for Heatspreader 3D models and drawings

3.9. Environmental Specification

The COMe-cAS6 (E2) supports commercial and industrial temperature grades.

Table 38: Environmental Specification

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)
Industrial Grade (E2)	Operating	-40°C to +85°C (-40°F to 185°F)
	Non-operating	-40°C to +85°C (-40°F to 185°F)
Relative Humidity		93 % @40°C, non-condensing
Shock (according to IEC / EN 60068-2-27)		Non-operating shock test (half-sinusoidal, 11ms, 15g)
Vibration (according to IEC / EN 60068-2-6)		Non-operating vibration (sinusoidal, 10 Hz to 2000 Hz, +/- 0.15 mm, 2 g)

3.10. Compliance

The COMe-cAS6 (E2) complies with the following or the latest status thereof. If modified, the prerequisites for specific approvals may no longer apply. For more information, contact JUMPtec Support.

Table 39: Compliance CE Mark

Europe - CE Mark	
Directives	2014/30/EU: Electromagnetic Compatibility 2014/35/EU: Low Voltage 2011/65/EU: RoHS II 2001/95/EC: General Product Safety
EMC	EN 55032 Class B: Electromagnetic compatibility of multimedia equipment - Emission Requirements Class A EN 61000-6-2: Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity standard for industrial environments
Safety	EN 62368-1: Audio/video, information and communication technology equipment - Part 1: Safety requirements

Table 40: 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.E547070 AZOT8.E547070
UK CA Mark	
EMC	BS EN 55032 Class B: Electromagnetic compatibility of multimedia equipment - Emission Requirements Class A BS EN 61000-6-2: Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity standard 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

If the product is modified, the prerequisites for specific approvals may no longer apply.

JUMPtec is not responsible for any radio television interference caused by unauthorized modifications of the delivered product or the substitution or attachment of connecting cables and equipment other than those specified by JUMPtec. The correction of interference caused by unauthorized modification, substitution or attachment is the user's responsibility.

3.11. 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, saltwater exposure) lower MTBF values.

MTBF (hours @40°C)	Part Number
tbd	

Table 41: MTBF

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.

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4/COMe Interface Connector

The COMe-cAS6 (E2) is a COM Express® Type 6 module providing two 220-pin connectors J1 and J2; each with two rows called row A & B on the primary connector J1 and row C & D on the secondary connector J2. Position of the connectors see Chapter 3.3.4.

4.1. Connecting COMe Interface Connector to Carrier Board

The COMe interface connector (J1) is inserted into the corresponding connector on the carrier board and 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.

ℹ	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.

4.2. J1 and J2 Signals

For a description of the terms used in the J1 pin assignment tables, see table given below. If a more detailed pin assignment description is required, refer to PICMG® COM.0 Revision 3.1 Base Specification.

Table 42: 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/PD	Pull-Up/Pull-Down Resistor
OA	Output Analog	PWR	Power Connection
OD	Output Open Drain	+/-	Differential Pair Differentiator

ℹ	The pin assignment tables list the internal pull-ups (PU) or pull-downs (PD) implemented by the chip vendors.

4.3. Connector J1

4.3.1. Connector J1 Pins A1 - A110, B1 - B110

Table 43: Connector J1 Pins A1 - A110

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	---	---

Pin	Signal	Description	Type	Termination	Comment
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	O	---	100nF capacitor to GND
A15	SUS_S3#	Suspend To RAM (or deeper) Indicator	O-3.3	PD 100K	---
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 100K	---
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 100K	---
A25	SATA2_RX+	SATA Receive Pair 2 +	DP-I	---	---
A26	SATA2_RX-	SATA Receive Pair 2 -	DP-I	---	---
A27	BATLOW#	Battery Low	I-3.3	PU 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	PD 100K	---
A31	GND_A31	Power Ground	PWR GND	---	---
A32	HDA_BITCLK	HD Audio Bit Clock Output	O-3.3	PD 100K	---
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 10K 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)

Pin	Signal	Description	Type	Termination	Comment
A48	RSMRST_OUT#	Buffered copy of the internal Module RSMRST# (Resume Reset, active low) signal.	O-3.3	PD 10K	---
A49	GBE0_SDP	Gigabit Ethernet Controller 0 Software-Definable Pin	I/O-3.3	PD 10K	---
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	Optional feature
A53	PCIE_TX5-	PCI Express Lane 5 Transmit -	DP-O	AC Coupled on Module	Optional feature
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	Optional feature
A56	PCIE_TX4-	PCI Express Lane 4 Transmit -	DP-O	AC Coupled on Module	Optional feature
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
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 3K9 3.3V (S0)	---
A84	LVDS_I2C_DAT	LVDS I2C Data (DDC) / EDP AUX -	I/O-3.3	PU 3K9 3.3V (S0)	---
A85	GPI3	General Purpose Input 3	I-3.3	PU 100K 3.3V (S0)	---
A86	GP_SPI_MOSI	General Purpose SPI Data out	O-3.3	---	---

Pin	Signal	Description	Type	Termination	Comment
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 (4.75-20V)	PWR 8.5-20V	---	---
A105	VCC_12V_A105	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A106	VCC_12V_A106	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A107	VCC_12V_A107	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A108	VCC_12V_A108	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A109	VCC_12V_A109	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
A110	GND_A110	Power Ground	PWR GND	---	---

Table 44: Connector J1 Pins B1 - B110

Pin	Signal	Description	Type	Termination	Comment
B1	GND	Power Ground	PWR GND	---	---
B2	GBE0_ACT#	Ethernet Activity LED	OD	---	---
B3	LPC_FRAME#/ ESPI_CS0	LPC Frame Indicator / eSPI Master Chip Select 0	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 20K 3.3V (S0)	---
B5	LPC_AD1/ ESPI_IO_1	LPC Multiplexed Command, Address & Data 1 / eSPI Master Data I/O 1	I/O-3. 3	PU 20K 3.3V (S0)	---
B6	LPC_AD2/ ESPI_IO_2	LPC Multiplexed Command, Address & Data 2 / eSPI Master Data I/O 2	I/O-3. 3	PU 20K 3.3V (S0)	---
B7	LPC_AD3/ ESPI_IO_3	LPC Multiplexed Command, Address & Data 3 / eSPI Master Data I/O 3	I/O-3. 3	PU 20K 3.3V (S0)	---

Pin	Signal	Description	Type	Termination	Comment
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	---	BOM Option 10k PU eSPI_noLPC
B10	LPC_CLK/ ESPI_CK	33MHz 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 3k9 3.3V (S5)	---
B14	SMB_DAT	SMBUS Data	I/O-3.3	PU 3k9 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 10k at 3.3V (S5)	20V protection circuit implemented on module
B25	SATA3_RX+	SATA 3 Receive Pair +	DP-I	---	---
B26	SATA3_RX-	SATA 3 Receive Pair -	DP-I	---	---
B27	WDT	Watch Dog Time-Out event	O-3.3	PD 10K	---
B28	HDA_SDIN2/ SNDW0_CLK	Not Connected/ SoundWire CLK	NC/ IO-1.8	---	Not supported/ Stuffing option
B29	HDA_SDIN1/ SNDW0_DAT	Audio Codec Serial Data in 1/ SoundWire Bi-directional Data	I-3.3/ IO-1.8	---	---/ Stuffing option
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	PD 100k	---
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 10k 1.8V (S5)	---
B48	USB0_HOST_PRSNT	Indication of HOST present	I-3.3	PD 47k	---
B49	SYS_RESET#	Reset Button Input	I-3.3	PU 10k 3.3V (S5)	---
B50	CB_RESET#	Carrier Board Reset	O-3.3	PD 10K	---
B51	GND_B51	Power Ground	PWR GND	---	---
B52	PCIE_RX5+	PCI Express Lane 5 Receive +	DP-I	---	Option on request
B53	PCIE_RX5-	PCI Express Lane 5 Receive -	DP-I	---	Option on request

Pin	Signal	Description	Type	Termination	Comment
B54	GPO1	General Purpose Output 1	O-3.3	PD 100k	---
B55	PCIE_RX4+	PCI Express Lane 4 Receive +	DP-I	---	Option on request
B56	PCIE_RX4-	PCI Express Lane 4 Receive -	DP-I	---	Option on request
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	---	---
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 4k7 3.3 (S0)	Only on VGA Option
B96	VGA_I2C_DAT	Display Data Channel Data	I/O-5	PU 4k7 3.3 (S0)	Only on VGA Option
B97	SPI_CS#	SPI Chip Select	O-3.3	PU 10k 3.3V (S5)	---
B98	GP_SPI_MISO	General Purpose SPI Data In	I-3.3	---	---
B99	GP_SPI_CK	General Purpose SPI Clock	O-3.3	---	---
B100	GND_B100	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
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 (4.75-20V)	PWR 8.5-20V	---	---
B105	VCC_12V_B105	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B106	VCC_12V_B106	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B107	VCC_12V_B107	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B108	VCC_12V_B108	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B109	VCC_12V_B109	Main Input Voltage (4.75-20V)	PWR 8.5-20V	---	---
B110	GND_B110	Power Ground	PWR GND	---	---

4.4. Connector J2

4.4.1. Connector J2 Pins C1 - C110, D1 - D110

Table 45: Connector J2 Pins C1 - 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	---	
C4	USB_SSRX0+	USB Super Speed Receive 0+	DP-I	---	
C5	GND_C5	Power Ground	PWR GND	---	---
C6	USB_SSRX1-	USB Super Speed Receive 1-	DP-I	---	
C7	USB_SSRX1+	USB Super Speed Receive 1+	DP-I	---	
C8	GND_C8	Power Ground	PWR GND	---	---
C9	USB_SSRX2-	USB Super Speed Receive 2-	DP-I	---	
C10	USB_SSRX2+	USB Super Speed Receive 2+	DP-I	---	
C11	GND_C11	Power Ground	PWR GND	---	---
C12	USB_SSRX3-	USB Super Speed Receive 3-	DP-I	---	
C13	USB_SSRX3+	USB Super Speed Receive 3+	DP-I	---	
C14	GND_C14	Power Ground	PWR GND	---	---
C15	USB4_1_LSTX	USB4 Side-Band TX Interface	O-3.3	---	USB4 not supported by default
C16	USB4_1_LSRX	USB4 Side-Band RX Interface	I-3.3	---	USB4 not supported by default
C17	USB4_RT_ENA	Power Enable for Carrier based USB Retimers	O-3.3	---	USB4 not supported by default
C18	GND_C18	Power Ground	PWR GND	---	---
C19	PCIE_RX6+	PCI Express Lane 6 Receive +	DP-I	---	Not supported
C20	PCIE_RX6-	PCI Express Lane 6 Receive -	DP-I	---	Not supported

Pin	Signal	Description	Type	Termination	Comment
C21	GND_C21	Power Ground	PWR GND	---	---
C22	PCIE_RX7+	PCI Express Lane 7 Receive +	DP-I		Not supported
C23	PCIE_RX7-	PCI Express Lane 7 Receive +	DP-I		Not supported
C24	DDI1_HPD	DDI1 Hotplug Detect	I-3.3	PD 100k	---
C25	SML0_CLK	System Management Link 0 Clock	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C26	SML0_DAT	System Management Link 0 Data	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C27	SML1_CLK	System Management Link 1 Clock	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C28	SML1_DAT	System Management Link 1 Data	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C29	USB4_PD_I2C_CLK	I2C to USB4 PD Controller Clock	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C30	USB4_PD_I2C_DAT	I2C to USB4 PD Controller Data	IO33-OD	PU 3.9V (S5)	USB4 not supported by default
C31	GND_C31	Power Ground	PWR GND	---	---
C32	DDI2_CTRLCLK_AUX+/ USB4_2_AUX+	DDI2 CTRLCLK/AUX+	I/O-3.3	PD 100k	USB4 not supported by default
C33	DDI2_CTRLDATA_AUX-/ USB4_2_AUX-	DDI2 CTRLDATA/AUX-	I/O-3.3	PU 100K 3.3V (S0)	USB4 not supported by default
C34	DDI2_DDC_AUX_SEL	DDI2 DDC/AUX select	I-3.3	PD 1M	---
C35	USB4_2_LSTX	"Low Speed" asynchronous serial TX line USB4	O-3.3	---	USB4 not supported by default
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	GP_SPI_CS#	General Purpose SPI Chip Select	O-3.3	---	---
C46	DDI3_PAIR2+	Digital Display Interface Pair 2+	DP-O	---	---
C47	DDI3_PAIR2-	Digital Display Interface Pair 2-	DP-O	---	---
C48	RSVD_C48	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	---	Not supported
C53	PEG_RX0-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
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	---	Not supported
C56	PEG_RX1-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
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	---	Not supported
C59	PEG_RX2-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported

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Pin	Signal	Description	Type	Termination	Comment
C60	GND_C60	Power Ground	PWR GND	---	---
C61	PEG_RX3+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C62	PEG_RX3-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C63	GND_C63	Power Ground	PWR GND	---	---
C64	GND_C64	Power Ground	PWR GND	---	---
C65	PEG_RX4+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C66	PEG_RX4-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C67	RAPID_SHUTDOWN	Trigger for Rapid Shutdown	NC	---	Not supported
C68	PEG_RX5+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C69	PEG_RX5-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C70	GND_C70	Power Ground	PWR GND	---	---
C71	PEG_RX6+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C72	PEG_RX6-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C73	GND_C73	Power Ground	PWR GND	---	---
C74	PEG_RX7+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C75	PEG_RX7-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C76	GND_C76	Power Ground	PWR GND	---	---
C77	GND_C77	Power Ground	PWR GND	---	---
C78	PEG_RX8+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C79	PEG_RX8-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C80	GND_C80	Power Ground	PWR GND	---	---
C81	PEG_RX9+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C82	PEG_RX9-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C83	GND_C83	Power Ground	PWR GND	---	---
C84	GND_C84	Power Ground	PWR GND	---	---
C85	PEG_RX10+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C86	PEG_RX10-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C87	GND_C87	Power Ground	PWR GND	---	---
C88	PEG_RX11+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C89	PEG_RX11-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C90	GND_C90	Power Ground	PWR GND	---	---
C91	PEG_RX12+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C92	PEG_RX12-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C93	GND_C93	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
C94	PEG_RX13+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C95	PEG_RX13-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C96	GND_C96	Power Ground	PWR GND	---	---
C97	GND_C97	Power Ground	PWR GND	---	---
C98	PEG_RX14+	PCI Express Graphics Receive Input differential pair	DP-I	---	Not supported
C99	PEG_RX14-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C100	GND_C100	Power Ground	PWR GND	---	---
C101	PEG_RX15+	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C102	PEG_RX15-	PCI Express Graphics Receive Input differential pairs	DP-I	---	Not supported
C103	GND_C103	Power Ground	PWR GND	---	---
C104	VCC_12V_C104	Main Input Voltage	PWR 8.5-20V	---	---
C105	VCC_12V_C105	Main Input Voltage	PWR 8.5-20V	---	---
C106	VCC_12V_C106	Main Input Voltage	PWR 8.5-20V	---	---
C107	VCC_12V_C107	Main Input Voltage	PWR 8.5-20V	---	---
C108	VCC_12V_C108	Main Input Voltage	PWR 8.5-20V	---	---
C109	VCC_12V_C109	Main Input Voltage	PWR 8.5-20V	---	---
C110	GND_C110	Power Ground	PWR GND	---	---

Table 46: Connector J2 Pins D1 - 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 +/ USB4_1_AUX+	Display Port AUX+ or Display Data Channel Clock	I/O-3.3	PD 100K	USB4 not supported by default
D16	DDI1_CTRLDATA_AUX-/ USB4_1_AUX-	Display Port AUX- or Display Data Channel Data	I/O-3.3	PU 100K 3.3V (S0)	USB4 not supported by default

Pin	Signal	Description	Type	Termination	Comment
D17	USB4_PD_I2C_ALERT#	I2C Alert from PD Controller	I-3.3	---	USB4 not supported by default
D18	PMCALERT#	Alert from Carrier PD Controller (associated with SML1)	I-3.3	PU 10k 3.3V (S5)	USB4 not supported by default
D19	PCIE_TX6+	PCIE Express Lane 6 Transmit +	DP-O	AC Coupled on Module	Not supported
D20	PCIE_TX6-	PCIE Express Lane 6 Transmit -	DP-O	AC Coupled on Module	Not supported
D21	GND_D21	Power Ground	PWR GND	---	---
D22	PCIE_TX7+	PCIE Express Lane 7 Transmit +	DP-O	AC Coupled on Module	Not supported
D23	PCIE_TX7-	PCIE Express Lane 7 Transmit -	DP-O	AC Coupled on Module	Not supported
D24	GND_D24	Power Ground	PWR GND	---	---
D25	GND_D25	Power Ground	PWR GND	---	---
D26	DDI1_PAIR0+	Digital Display Interface Pair 0 +	DP-O/	---	USB4 not supported by default
D27	DDI1_PAIR0-	Digital Display Interface Pair 0 -	DP-O	---	USB4 not supported by default
D28	GND _D28	Power Ground	PWR GND	---	---
D29	DDI1_PAIR1+/ USB4_1_SSRX0+	Digital Display Interface Pair 1 +	DP-IO	---	USB4 not supported by default
D30	DDI1_PAIR1-/ USB4_1_SSRX0-	Digital Display Interface Pair 1 -	DP-IO/	---	USB4 not supported by default
D31	GND_D31	Power Ground	PWR GND	---	---
D32	DDI1_PAIR2+/ USB4_1_SSTX1+	Digital Display Interface Pair 2 +	DP-O	---	USB4 not supported by default
D33	DDI1_PAIR2-/ USB4_1_SSTX1-	Digital Display Interface Pair 2 -	DP-O	---	USB4 not supported by default
D34	DDI1_DDC_AUX_SEL	DDI1 DDC/AUX select	I-3.3	PD 1M	---
D35	USB4_2_LSRX	USB4 Side-Band RX Interface	I-3.3	---	USB4 not supported by default
D36	DDI1_PAIR3+ / USB4_1_SSRX1+	Digital Display Interface Pair 3 +	DP-IO	---	USB4 not supported by default
D37	DDI1_PAIR3- / USB4_1_SSRX1-	Digital Display Interface Pair 3 -	DP-IO	---	USB4 not supported by default
D38	GND_D38	Power Ground	PWR GND	---	---
D39	DDI2_PAIR0+/ USB4_2_SSTX0+	Digital Display Interface Pair 0 +	DP-O	---	USB4 not supported by default
D40	DDI2_PAIR0-/ USB4_2_SSTX0-	Digital Display Interface Pair 0 -	DP-O	---	USB4 not supported by default
D41	GND_D41	Power Ground	PWR GND	---	---
D42	DDI2_PAIR1+/ USB4_2_SSRX0+	Digital Display Interface Pair 1 +	DP-IO	---	USB4 not supported by default
D43	DDI2_PAIR1- USB4_2_SSRX0-	Digital Display Interface Pair 1 -	DP-IO	---	USB4 not supported by default
D44	DDI2_HPD	DDI2 Hotplug Detect	I-3.3	PD 100K	---
D45	GND _D45	Power Ground	PWR GND	---	---
D46	DDI2_PAIR2+ /USB4_2_SSTX1+	Digital Display Interface Pair 2 +	DP-O	AC Coupled on Module	USB4 not supported by default
D47	DDI2_PAIR2- /USB4_2_SSTX1-	Digital Display Interface Pair 2 -	DP-O	AC Coupled on Module	USB4 not supported by default
D48	GND_D48	Power Ground	PWR GND	---	---
D49	DDI2_PAIR3+ /USB4_2_SSRX1+	Digital Display Interface Pair 3 +	DP-IO	---	USB4 not supported by default
D50	DDI2_PAIR3- /USB4_2_SSRX1-	Digital Display Interface Pair 3 -	DP-IO	---	USB4 not supported by default

Pin	Signal	Description	Type	Termination	Comment
D51	GND_D51	Power Ground	PWR GND	---	---
D52	PEG_TX0+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D53	PEG_TX0-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D54	PEG_LANE_RV#	PCI Express Graphics lane reversal input strap. Pull low on the carrier board to reverse lane order	I-3.3	---	Not supported
D55	PEG_TX1+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D56	PEG_TX1-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D57	TYPE2#	GND for type 6 module	PWR	---	---
D58	PEG_TX2+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D59	PEG_TX2-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D60	GND_D60	Power Ground	PWR GND	---	---
D61	PEG_TX3+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D62	PEG_TX3-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D63	GND_D63	Power Ground	PWR GND	---	---
D64	GND_D64	Power Ground	PWR GND	---	---
D65	PEG_TX4+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D66	PEG_TX4-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D67	GND_D67	Power Ground	PWR GND	---	---
D68	PEG_TX5+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D69	PEG_TX5-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D70	GND_D70	Power Ground	PWR GND	---	---
D71	PEG_TX6+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D72	PEG_TX6-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D73	GND_D73	Power Ground	PWR GND	---	---
D74	PEG_TX7+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D75	PEG_TX7-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D76	GND_D76	Power Ground	PWR GND	---	---
D77	GND_D77	Power Ground	PWR GND	---	---
D78	PEG_TX8+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D79	PEG_TX8-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D80	GND_D80	Power Ground	PWR GND	---	---
D81	PEG_TX9+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D82	PEG_TX9-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D83	GND_D83	Power Ground	PWR GND	---	---
D84	GND_D84	Power Ground	PWR GND	---	---

Pin	Signal	Description	Type	Termination	Comment
D85	PEG_TX10+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D86	PEG_TX10-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D87	GND_D87	Power Ground	PWR GND	---	---
D88	PEG_TX11+	PCI Express Graphics Transmit Output differential pair	DP-O	---	Not supported
D89	PEG_TX11-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D90	GND_D90	Power Ground	PWR GND	---	---
D91	PEG_TX12+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D92	PEG_TX12-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D93	GND_D93	Power Ground	PWR GND	---	---
D94	PEG_TX13+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D95	PEG_TX13-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D96	GND_D96	Power Ground	PWR GND	---	---
D97	GND_D97	Power Ground	PWR GND	---	---
D98	PEG_TX14+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D99	PEG_TX14-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D100	GND_D100	Power Ground	PWR GND	---	---
D101	PEG_TX15+	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D102	PEG_TX15-	PCI Express Graphics Transmit Output differential pairs	DP-O	---	Not supported
D103	GND_D103	Power Ground	PWR GND	---	---
D104	VCC_12V_D104	Main Input Voltage	PWR 8.5-20V	---	---
D105	VCC_12V_D105	Main Input Voltage	PWR 8.5-20V PWR	---	---
D106	VCC_12V_D106	Main Input Voltage	PWR 8.5-20V PWR	---	---
D107	VCC_12V_D107	Main Input Voltage	PWR 8.5-20V PWR	---	---
D108	VCC_12V_D108	Main Input Voltage	PWR 8.5-20V PWR	---	---
D109	VCC_12V_D109	Main Input Voltage	PWR 8.5-20V PWR	---	---
D110	GND_D110	Power Ground	PWR GND	---	---

4.5. Changes between COM.0 Rev 3.0 and Rev 3.1

Table 47: Comparison Pinout Type 6 COM.0 Rev 3.0 vs. Rev 3.1

	Type 6 Rev 3.0		Type 6 Rev 3.1	
Pin	Row A	Row B	Row A	Row B
28	(S)ATA_ACT#	HDA_SDIN2	(S)ATA_ACT#	HDA_SDIN2/**SNDW0_CLK**
29	HDA_SYNC	HDA_SDIN1	HDA_SYNC	HDA_SDIN1/**SNDW0_DAT**
48	RSVD	USB0_HOST_PRSNT	**RSMRST_OUT#**	USB0_HOST_PRSNT
86	RSVD	VCC_5V_SBY	**GP_SPI_MOSI**	VCC_5V_SBY

Pin		
98	SER0_TX	RSVD	SER0_TX	**GP_SPI_MISO**
99	SER0_RX	RSVD	SER0_RX	**GP_SPI_CK**

	Type 6 Rev 3.0		Type 6 Rev 3.1	
Pin	Row C	Row D	Row C	Row D
15	DDI1_PAIR6+	DDI1_CTRLCLK_AUX+	**USB4_1_LSTX**	DDI1_CTRLCLK_AUX+/**USB4_1_AUX+**
16	DDI1_PAIR6-	DDI1_CTRLDATA_AUX-	**USB4_1_LSRX**	DDI1_CTRLDATA_AUX-/**USB4_1_AUX-**
17	RSVD	RSVD	**USB4_RT_ENA**	**USB4_PD_I2C_ALERT#**
18	RSVD	RSVD	**GND**	**PMCALERT#**
24	DDI1_HPD	RSVD	DDI1_HPD	**GND**
25	DDI1_PAIR4+	RSVD	**SML0_CLK**	**GND**
26	DDI1_PAIR4-	DDI1_PAIR0+	**SML0_DAT**	DDI1_PAIR0+/**USB4_1_SSTX0+**
27	RSVD	DDI1_PAIR0-	**SML1_CLK**	DDI1_PAIR0-/**USB4_1_SSTX0-**
28	RSVD	RSVD	**SML1_DAT**	**GND**
29	DDI1_PAIR5+	DDI1_PAIR1+	**USB4_PD_I2C_CLK**	DDI1_PAIR1+/**USB4_1_SSRX0+**
30	DDI1_PAIR5-	DDI1_PAIR1-	**USB4_PD_I2C_DAT**	DDI1_PAIR1-/**USB4_1_SSRX0-**
32	DDI2_CTRLCLK_AUX+	DDI1_PAIR2+	DDI2_CTRLCLK_AUX+/**USB4_2_AUX+**	DDI1_PAIR2+/**USB4_1_SSTX1+**
33	DDI2_CTRLDATA_AUX-	DDI1_PAIR2-	DDI2_CTRLDATA_AUX-/USB4_2_AUX-	DDI1_PAIR2-/**USB4_1_SSTX1-**
35	RSVD	RSVD	**USB4_2_LSTX**	**USB4_2_LSRX**
36	DDI3_CTRLCLK_AUX+	DDI1_PAIR3+	DDI3_CTRLCLK_AUX+	DDI1_PAIR3+/**USB4_1_SSRX1+**
37	DDI3_CTRLDATA_AUX-	DDI1_PAIR3-	DDI3_CTRLDATA_AUX-	DDI1_PAIR3-/**USB4_1_SSRX1-**
38	DDI3_DDC_AUX_SEL	RSVD	DDI3_DDC_AUX_SEL	**GND**
39	DDI3_PAIR0+	DDI2_PAIR0+	DDI3_PAIR0+	DDI2_PAIR0+/**USB4_2_SSTX0+**
40	DDI3_PAIR0-	DDI2_PAIR0-	DDI3_PAIR0-	DDI2_PAIR0-/**USB4_2_SSTX0-**
42	DDI3_PAIR1+	DDI2_PAIR1+	DDI3_PAIR1+	DDI2_PAIR1+/**USB4_2_SSRX0+**
43	DDI3_PAIR1-	DDI2_PAIR1-	DDI3_PAIR1-	DDI2_PAIR1-/**USB4_2_SSRX0-**
45	RSVD	RSVD	**GP_SPI_CS#**	**GND**
46	DDI3_PAIR2+	DDI2_PAIR2+	DDI3_PAIR2+	DDI2_PAIR2+/**USB4_2_SSTX1+**
47	DDI3_PAIR2-	DDI2_PAIR2-	DDI3_PAIR2-	DDI2_PAIR2-/**USB4_2_SSTX1-**
48	RSVD	RSVD	RSVD	GND
49	DDI3_PAIR3+	DDI2_PAIR3+	DDI3_PAIR3+	DDI2_PAIR3+/**USB4_2_SSRX1+**
50	DDI3_PAIR3-	DDI2_PAIR3-	DDI3_PAIR3-	DDI2_PAIR3-/**USB4_2_SSRX1-**
63	RSVD	RSVD	**GND**	**GND**
64	RSVD	RSVD	**GND**	**GND**
77	RSVD	RSVD	**GND**	**GND**
83	RSVD	RSVD	**GND**	**GND**
97	RSVD	RSVD	**GND**	**GND**

5/UEFI BIOS

5.1. Starting the UEFI BIOS

The COMe-cAS6 (E2) uses a JUMPtec-customized, pre-installed and configured version of AMI Aptio® V BIOS based on the Unified Extensible Firmware Interface (UEFI) specification and the Intel® Platform Innovation Framework for EFI.
The UEFI BIOS provides a variety of new and enhanced functions specifically tailored to the hardware features of the COMe-cAS6 (E2).

> **i** This chapter provides an overview of the BIOS and its setup. A more detailed listing and description of all BIOS setup nodes can be found in the BIOS file package available on our Customer Section. Please register there to get access to BIOS downloads and Product Change Notifications.

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 default configuration. The Setup program allows access to various menus resp. sub-menus that provide the 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 Security Setup Menu), press <RETURN>, and proceed with step 5.

5. The Setup menu appears
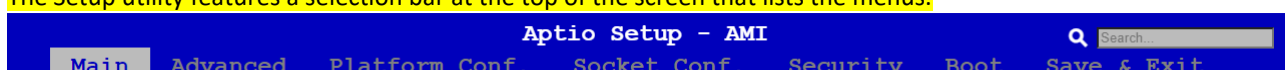
5.2. Navigating the UEFI BIOS

The COMe-cAS6 (E2) UEFI BIOS Setup program uses a hot key navigation system. The hot key legend bar is located at the bottom of the Setup screens. The following table provides a list of navigation hot keys available in the legend bar.

Table 48: 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

5.3. Setup Menus

The Setup utility features a selection bar at the top of the screen that lists the menus.

```
                        Aptio Setup – AMI                    🔍 Search...
   Main   Advanced   Platform Conf.   Socket Conf.   Security   Boot   Save & Exit
```

Figure 7: Setup Menu Selection Bar

The Setup menus available for the COMe-cAS6 (E2) are:

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

The currently active menu and the currently active UEFI BIOS Setup item are highlighted in white. Use the left and right arrow keys to select the Setup menus.
Each Setup menu provides two main frames. The left frame displays all available functions. Configurable functions are displayed in blue. Functions displayed in grey provide information about the status or the operational configuration.

5.4. Getting Help

The right frame displays a Help window providing an explanation of the respective function.

5.5. UEFI Shell

The JUMPtec 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/

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

5.5.1. 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'

```
UEFI Interactive Shell v2.2
EDK II / JUMPtec add-on v0.3
UEFI v2.80 (American Megatrands, 0x0005001A)
map: No mapping found.
```

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

```
Shell>
```

5.5.2. Exiting the UEFI Shell

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

- ❯ Use the *exit* UEFI Shell command to select the boot device, in the Boot menu, that the OS boots from
- ❯ Reset the board using the *reset* UEFI Shell command
- ❯ Press the reset button of the board or power down/up the board

5.6. UEFI Shell Scripting

5.6.1. 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. It searches for scripts and executes them in the following order:

1. Initially searches for JUMPtec flash-stored startup script.

2. If there is no JUMPtec 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.

5.6.2. 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.

5.6.3. Example of Startup Scripts

Execute Shell Script on other Harddrive

This example (**startup.nsh**) executes the shell script named **bootme.nsh** located in the root of thefirst detected disk drive (**fs0**).

```
fs0:
bootme.nsh
```

5.7. Firmware Update

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

> Register to JUMPtec's Customer Section to get access to BIOS downloads, additional documentation and Product Change Notification service.

6/Technical Support

For technical support contact our Support Department:

❯ E-mail: techsupport@jumptec.com

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

❯ Product ID Number (P/N),

❯ Serial Number (SN) Module's revision

❯ Operating System and Kernel/Build version

❯ Software modifications

❯ Additional connected hardware/full description of hardware set up

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

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

6.1. 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 lithium battery, for example.

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

6.2. Returning Defective Merchandise

All equipment returned to JUMPtec must have a Return of Material Authorization (RMA) number assigned exclusively by JUMPtec. JUMPtec 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 JUMPtec's designated facility. JUMPtec 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 JUMPtec.

1. Visit the RMA Information website: https://www.jumptec.com/en/support/rma-information

2. **Download the RMA Request sheet for JUMPtec GmbH and fill out the form. Take care to include a short** detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product.

3. Send the completed RMA-Request form to the email address given at JUMPtec GmbH. JUMPtec will provide an RMA-Number.

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

ℹ	Goods returned to JUMPtec 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 JUMPtec RMA Support.

7/Storage and Transportation

7.1. Storage

If the product is not in use for an extended period time, disconnect the power plug from the power supply. If it is necessary to store the product then re-pack the product as originally delivered to avoid damage. The storage facility must meet the products environmental storage requirements as stated within this user guide. JUMPtec recommends keeping the original packaging material for future storage or warranty shipments.

7.2. Transportation

To ship the product use the original packaging, designed to withstand impact and adequately protect the product. When packing or unpacking products always take shock and ESD protection into consideration and use an EOS/ESD safe working area.

About JUMPtec

JUMPtec specializes its technical expertise in designing both - standard and highly customized compute products. Our newly optimized structure enables us to take customers from prototyping and design through to mass production faster than ever before.

JUMPtec serves a diverse range of markets, providing innovative solutions tailored to the unique needs of each industry. Find out more about our offering!

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

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