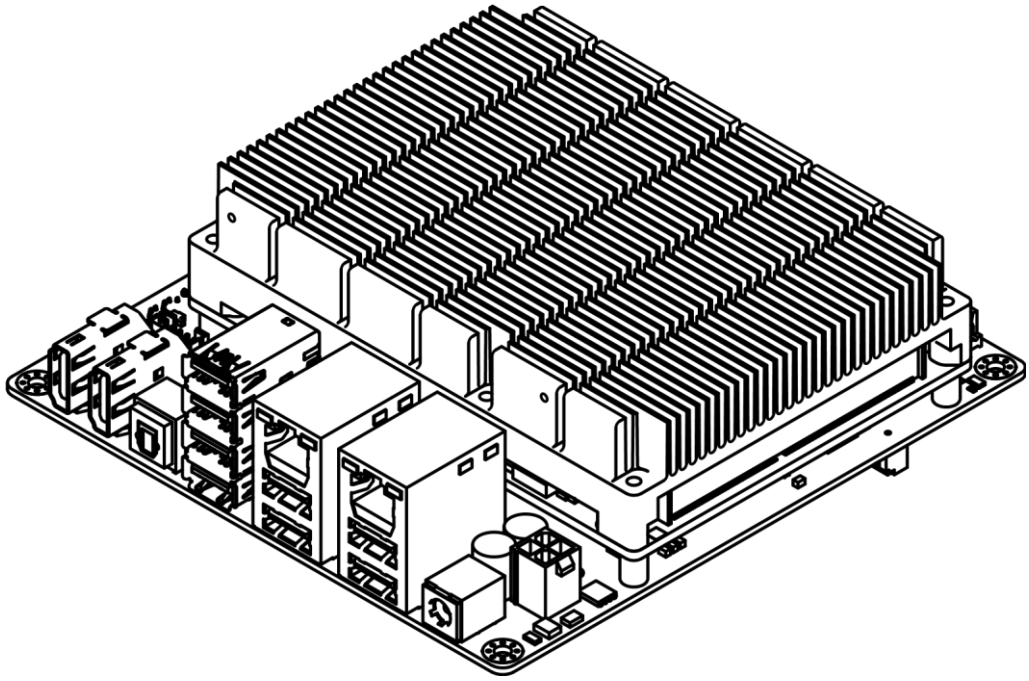
BIVROST® Lite5 Platform Quickstart



The BIVROST Lite5 Platform is a 5” STX motherboard designed to face all the challenges of the AI, edge computing, and video streaming age.

Created to take I/O capacity to a whole new level; maximise the potential of the unified memory architecture; have the ability to run 24/7.

European Union funds

R&D project disclaimer

This product was created based on results of the R&D project granted by European Union and financed from European Regional Development Fund under the Smart Growth Program, implemented as a part of ‘Szybka Ścieżka’ competition organized by The National Centre of Research and Development under agreement POIR.01.01.01-00-1111/17-00 "Development of a multi-camera system that capture and process stereoscopic video dedicated for virtual reality with multi-channel streaming architecture.".



Product Description

Overview

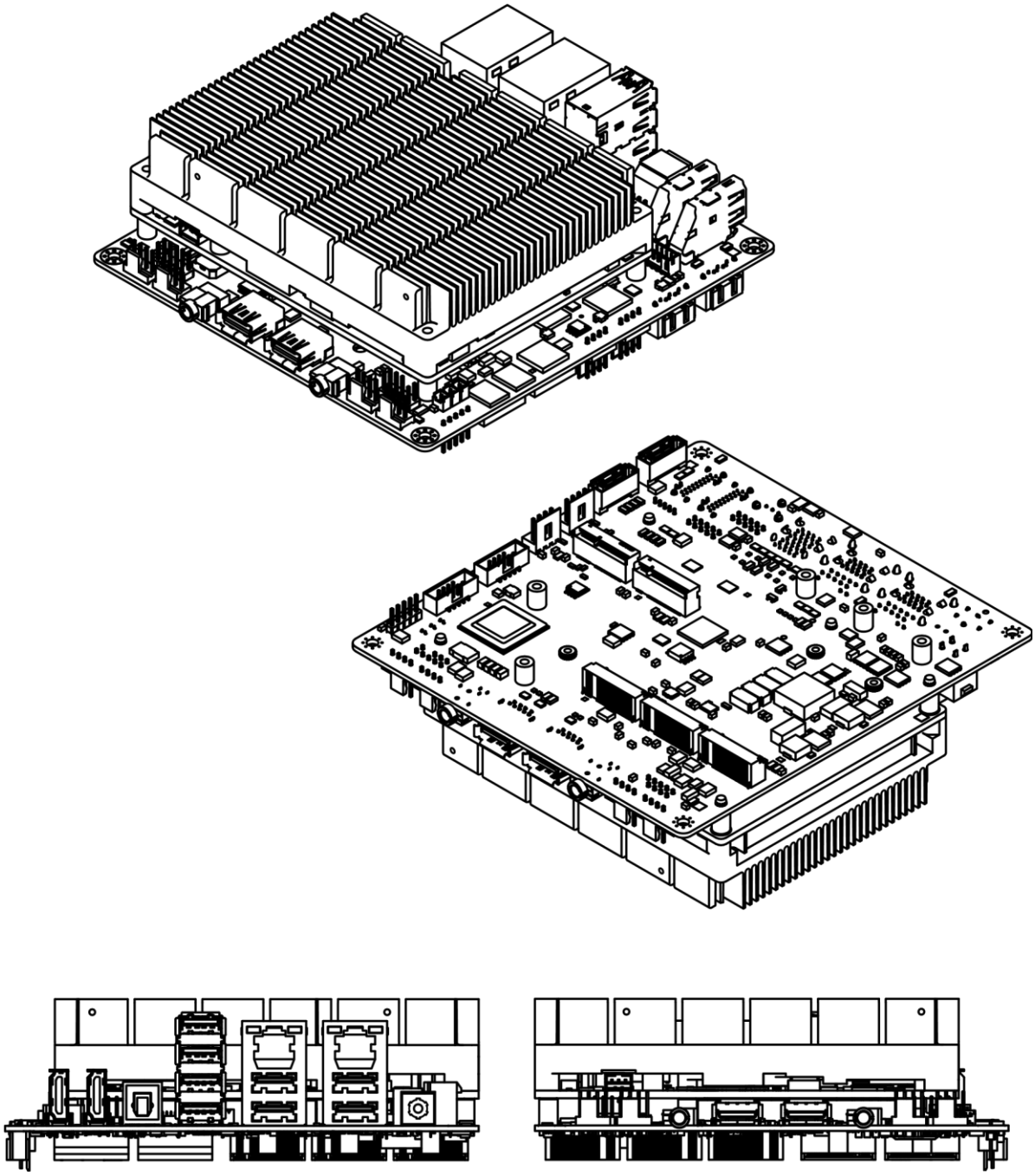


Figure 1. BIVROST® Lite5 Platform overview

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Revision History

Revision	Revision History	Date
1.0	First release	January 2020
-	-	-

Latest Quickstart version can be downloaded from:

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https://bivrost.pro/Lite5_Quickstart.pdf
```

1. Product Description

⚠ CAUTION ⚠

BIVROST® Lite5 Platform can be supplied with 19V **or** 12V power input.

NEVER CONNECT BOTH POWER SOURCES AT THE SAME TIME!

This **will** damage the board.

1.1 Overview

BIVROST® Lite5 Platform is high performance, hi-I/O integrated solution designed to deliver optimal compute power and I/O performance for critical integrated or edge computing solutions.

Compute power

Lite5 Platform provides hexa-core CPUs with SMT (Hyper-Threading) technology for 12 thread processing power and up to 4.3 GHz single thread clock. Thanks to 8th generation embedded Intel® Core™ processors and thermal design power set to 45W sustained load is possible at high clock frequencies without thermal throttling reaching over 110 GFLOPs or raw CPU performance.

Media processing

Lite5 Platform was designed with fast media processing in mind. Integrated Intel UHD 630 graphics can extensively accelerate video decoding and encoding with multiple streams up to 4K@60 with low power footprint. Unified memory lowers bandwidth requirements extending available video memory up to half installed system memory (8GB in basic configuration) for data intensive tasks. Selected GPU also provides GPGPU compute features like OpenCL, DirectCompute and Vulkan API support.

Industrial design and standards

BIVROST® Lite5 Platform is designed and manufactured based on industry-leading Advantech production lines. It meets requirements of 24/7 service just like any other industrial computer unit. Thermal design and industrial grade components guarantee long product lifespan.

Hardware platform benefits from COM Express standard. Off the shelf COM Express Basic Type 6 module from Advantech lowers production cost of custom designed carrier board.

Form factor

Mini-STX 5" form factor gives extremely dense performance per cubic centimetre. It allows exceedingly small designs while maintaining desktop-class performance. Effective cooling solution with direct copper on core design keeps temperature under control preventing thermal throttling.

Future proofing

COM Express standard futureproofs BIVROST® Lite5 Platform to be forward compatible with upcoming 11-gen or newer Intel® processors. With additional CPU power and much faster 12th generation graphics new SOM modules can replace current 8th gen units used for this platform without product redesign and postponing market entry*.

Design goals

- Smallest form factor allowing high performance computing. Performance level reference: real time 4K video capture, mixing, colour grading and streaming with sub-10 frame latency.
- Optimal usage of Unified Memory Architecture (UMA) to allow fast in-place data operations (zero-copy paradigm).
- Focus on iGPU acceleration as a coprocessor for data processing (not only graphical data).
- Maximizing usage of CPU routed PCIe lanes for ultra-fast I/O performance:
  - Full bandwidth for 3 M.2 M-Key PCIe x4 ports simultaneously
  - Full bandwidth for 4 USB 3 ports working simultaneously
- Fast redundant Gigabit networking
- Flexible power options
  - External 19VDC power input
  - Internal 12VDC ATX input
- Low noise operation

* New SOM modules must provide required features. Platform firmware may need additional rework.



Figure 2. BIVROST® Lite5 Platform top view

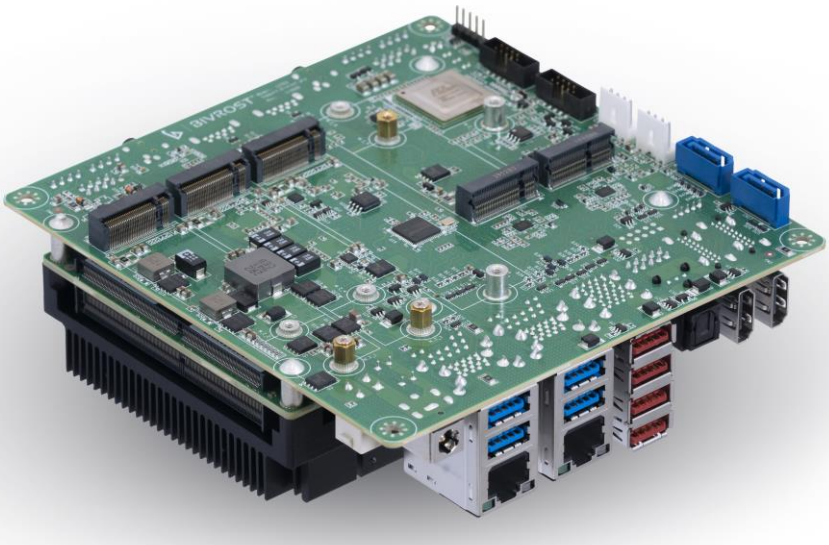


Figure 3. BIVROST® Lite5 Platform bottom view

1.2 Version Summary

There are two versions of BIVROST® Lite5 Platform which are summarized in Table1. Both versions differ only in terms of CPU model. All board features are available in all models.

Version	CPU Model	Cores / Threads	Default Memory Configuration	TDP
Lite5 i7	Intel® Core™ i7-8850H	6 / 12	2x 8GB DDR4 2666 dual channel mode	45W
Lite5 i5	Intel® Core™ i5-8400H	4 / 8	2x 8GB DDR4 2400 dual channel mode	45W

Table 1. Version Summary

Intel® Core™ i5-8400H Processor (8M Cache, up to 4.20 GHz) Product Specifications

Intel® Core™ i7-8850H Processor (9M Cache, up to 4.30 GHz) Product Specifications

1.3 Feature Summary

Feature	Specification
Form factor	Mini-STX 5" x 5" (147×140 mm)
CPU	Intel i7-8850H (6 cores / 12 threads, 2.6Ghz - 4.3GHz, 9MB cache, 45W TDP) Intel i7-8400H (4 cores / 8 threads, 2.5Ghz - 4.2GHz, 8MB cache, 45W TDP)
Cooling	High efficiency / no thermal throttling cooling
DRAM	2x 8GB DDR4 2666 in dual channel mode (up to 96GB), ECC optional
Ethernet	2x Gigabit Ethernet
Graphics	Integrated Intel UHD 630 graphics with 24 Compute Units | Supporting 2 independent display units (4K) | DirectX 12 support | H.264/AVC HW 8b | H.265/HEVC HW 8/10b | 2x HDMI 2.0
Video output	2x HDMI 2.0 (4K)
Expansion	3x M.2 2280/2260 slots M key (4x PCIe 3.0 lanes per slot) [1] 1x M.2 2242/2260 slot for SATA SSD system drive 1x M.2 2230/2232 slot for WiFi card

Feature[1]	Specification
I/O Interfaces	2x 3.5mm headphones and microphone jacks 2x USB 3 (5Gbps) front ports (shared bandwidth) 4x USB 3.1 (10Gbps) rear connectors (shared bandwidth) 4x USB 3.1 (10Gbps) rear connectors (dedicated bandwidth[2]) 1x optical audio out 2x HDMI 2.0 4K output
Internal Connectors	1x LVDS 24bit Dual channel, max. 1920x1200@60Hz 1x Backlight (power, control) 8x GPIO with PWM support[3] 2x UART 1x I2C 1x 5.1 HD audio header 2x USB 2.0 9-pin header 2x SATA3 2x aux power 5V/12V (up to 1A load) 4x programmable 4-pin PWM fan headers
Power	12V internal (4-pin ATX connector) [4] 19V external (DC jack 5.5/2.5 mm) [4] 180W power supply rating
Operating Systems	Windows 10 Ubuntu 18.04 or newer
Temperature	Operating: 0 to +40°C Storage: -20 to +60°C
Humidity	10% to 85% @ 40^{o} r. H. non cond.
Size	147 × 140 mm (5.79” x 5.51”)

Table 2. Feature Summary

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[1] Two M.2 ports with 2260 size option, one with 2280 mounting point fixed.

[2] 16 Gbps shared bandwidth per each port pair

[3] Only 4 GPIO pins support PWM

[4] Either 12V or 19V may be connected at a time. Connecting both **will damage the board**.

1.4 Use cases

BIVROST® Lite5 Platform is suitable to use in many cases. Platform versatility is greatly expanded thanks to unique features like:

- Dedicated USB 3.2 bandwidth for parallel data capture
- Dedicated PCIe 3.0 4x lanes for each of three M.2 ports for internal expansion cards
- System integration features like GPIO, I^2C, UART, internal SATA, internal AUX power options
- Hardware video decoding and encoding with low power mode capabilities
- Dual Gigabit networking

Analog and digital audio output

Examples of platform applications are described in points 1.4.1, 1.4.2 and 1.4.3.

1.4.1 Case 1 - Video processing unit

Use case: small form factor video processing unit capable of real-time operation and streaming on wired and wireless networks.

Key platform features and their usage:

- 2x M.2 M-Key ports - two dual channel 4K capture cards. Ports are directly wired to CPU PCIe lanes providing guaranteed bandwidth (no lane sharing) for multiple 4K channels and lowest latency.
- M.2 M-Key port - populated with NVMe SSD as fast media storage for high-bitrate content recording.
- Dual Gigabit networking - redundant operation or local studio network separation (safety reasons).
- Quiet operation - prevents unwanted noise in a studio environment during audio recording.
- Small footprint - great portability and safer transportation.



Figure 4. LiveStreamMachine unit based on BIVROST® Lite5 Platform

In this scenario M.2 ports may be populated in two configurations.

Option 1: 4K dual channel capture option:

- Both M.2 2280 with M-Key wired to CPU are populated with Magewell Eco Capture HDMI 4K M.2 cards

```
https://www.magewell.com/products/eco-capture-hdmi-4k-m2
```

- M.2 2280 with M-Key wired to CPU via PCIe switch is populated with Advantech 1.9TB NVMe SSD

Option 2: FullHD quad-channel capture option:

- Both M.2 2280 with M-Key wired to CPU are populated with Magewell Eco Capture Dual HDMI M.2 cards

```
https://www.magewell.com/products/eco-capture-dual-hdmi-m2
```

- M.2 2280 with M-Key wired to CPU via PCIe switch is populated with Advantech 1.9TB NVMe SSD

Thanks to dedicated (not shared) PCIe bandwidth for each M.2 port both capture cards can work at full resolution and framerate simultaneously. Each card requires 2 PCIe gen 2.0 lanes which saturates only ~25% of the available bandwidth per port.

At the same time high speed recording is possible on the third M.2 2280 port with the same available bandwidth as ports with capture cards.

All three ports can work at full speed independently. PCI Express bandwidth is NOT shared and there is no performance bottleneck present with traditional PCH and DMI extension card wiring.

If future cards will support dual 4K capture on one card the remaining available M.2 bandwidth will be more than enough to handle capture device requirements.

1.4.2 Case 2 - Data / Media server

Use case: as a main unit for integrated data or media server with network access and/or display capabilities

Key platform features and their usage:

- M.2 M-Key ports - suitable for fast NVMe cache drives.
- Dual Gigabit networking - fast network access to server data.
- Quiet operation - prevents unwanted noise during media playback and office use.
- SATA ports, internal AUX power - integrated internal high-capacity drives.
- Power efficiency - lowering operation cost.
- Hardware accelerated video processing - smooth video playback up to 8K resolution, media transcoding.
- Hexa-core CPU with AES support - fast data transfers, calculating data hashes with software raid support and SSD caching.
- Internal or external power input - flexible device design with either internal or external power supply depending on usage scenario.

Example M.2 hardware configuration for media server:

- M.2 M-Key port with Advantech 1.9TB NVMe SSD for HDD drives caching using 4x PCIe 3.0 lanes which gives up to ~3600MB/s real life data transfers
- M.2 M-Key port with Advantech 1.9TB NVMe SSD for HDD drives caching using 4x PCIe 3.0 lanes which gives up to ~3600MB/s real life data transfers

Both drives can achieve their maximum performance working independently at the same time while OS / Firmware can be installed on a 2242 SATA system SSD.

1.4.3 Case 3 - Machine vision node

Use case: vision processing unit with machine learning capabilities, 24/7 operations at production lines or surveillance.

Key platform features and their usage:

- 3x M.2 M-Key ports - each port populated with AI / Machine learning hardware inference accelerator offloading object and patterns recognition from main CPU and GPU.
- Dual Gigabit networking - redundant operation for enhanced reliability.
- Quiet operation - prevents unwanted noise in studio environment during sound recording.
- GPIO / UART / I^2C - easy direct integration with existing infrastructure.
- Power efficiency - lowering operation cost.
- Industrial grade components - uninterrupted 24/7 operation with warranty coverage.

High bandwidth USB ports - USB3 Vision or GigE Cameras (via adapter) inputs capable of 8Gbps data transfer allowing highest possible image quality in terms of bitrate, resolution and colour quality.

M.2 hardware accelerators for machine learning:

- All 3x M.2 M-Key ports with installed AI CORE XM 2280

```
https://www.aaeon.com/en/p/ai-edge-computing-board-ai-core-xm-2280
```

Three full size M.2 ports gives option to install six AI inference accelerators based on Intel Movidius chips to enhance machine learning capabilities and offload GPU and CPU giving more headroom for video processing. This is possible without sacrificing boot performance as SATA SSD is installed in an additional dedicated M.2 2242 port.

2. Technical Reference 2.1 Block diagram

Figure1 is a block diagram of the major functional areas of the BIVROST® Lite5 Platform.

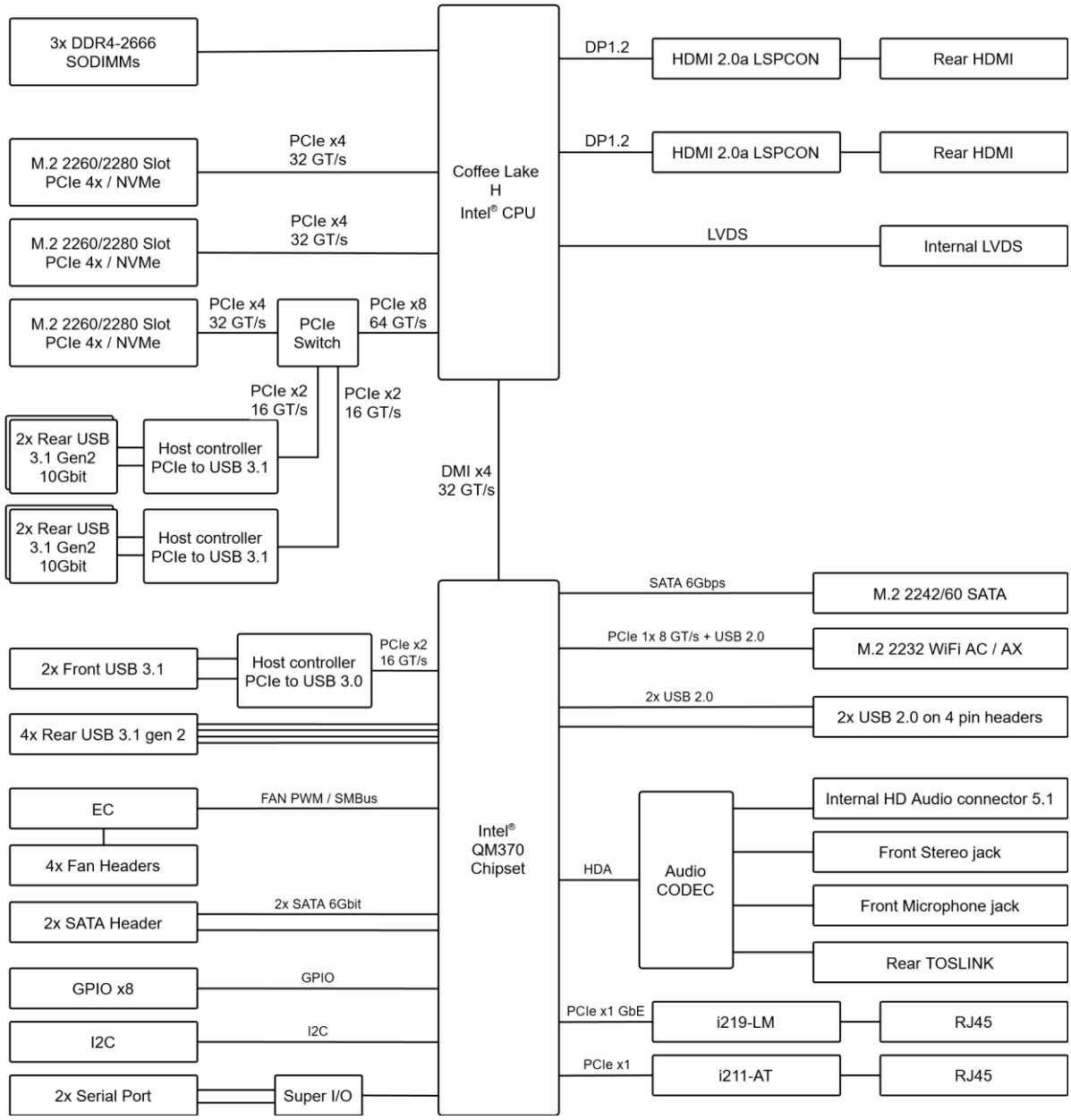


Figure 5. Block Diagram

2.2 Processor

8th gen Intel® Core™ i7 / i5 embedded on Advantech System on module SOM-5899: Form factor: COM Express Basic Module Pin-out type: COM Express R3.0 Type 6 pin out

Advantech SOM-5899 specification:

- product page

  ```
  https://www.advantech.com/products/9b97accf-0a5b-4166-bf75-38159d579dec/som-5899/mod_39c25051-fa19-4708-bd6f-f30645874f2
  ```

- datasheet

  ```
  https://advdownload.advantech.com/productfile/PIS/SOM-5899/file/SOM-5899_DS(081820)20200818172932.pdf
  ```

8th gen Intel® Core™ i7 / i5 architecture features:

- High memory bandwidth: dual channel DDR4-2666 configuration (~25GB/s real world transfers)
- SIMD instruction sets: Intel® SSE4.1, Intel® SSE4.2, Intel® AVX2
- 20 PCIe 3.0 lanes with bifurcation support
- Hardware AES acceleration
- Unified Memory Architecture

8th gen Intel® Core™ i7 / i5 specifications:

- Intel® Core™ i7-8850H Processor (9M Cache, up to 4.30 GHz) Product Specifications

  ```
  https://ark.intel.com/content/www/us/en/ark/products/134899/intel-core-i78850h-processor-9m-cache-up-to-4-30-ghz.html
  ```

- Intel® Core™ i5-8400H Processor (8M Cache, up to 4.20 GHz) Product Specifications

  ```
  https://ark.intel.com/content/www/us/en/ark/products/134877/intel-core-i58400h-processor-8m-cache-up-to-4-20-ghz.html
  ```

2.3 Platform Controller Hub (PCH)

Intel QM370 Mobile chipset specification:

```
https://ark.intel.com/content/www/us/en/ark/products/135102/mobile-intel-qm370-chipset.html
```

2.4 System Memory

BIVROST® Lite5 Platform comes with preinstalled 16GB DDR4 2400 or 2666 (depends on CPU option). SOM modules contain 3 slots for SODIMM modules. Maximum memory size that can be installed: 96GB (3x32GB). Maximum suggested memory size: 64GB (2x32). To ensure proper dual channel 128bit operation please use only two slots on the top of compute module (under the heatsink).

2.5 Processor Graphics Subsystem

Integrated Intel® UHD Graphics 630 with Unified Memory Architecture.

Main features:

- Base frequency: 350MHz
- Maximum dynamic frequency: 1150Mhz (1100MHz i5 version)
- Execution units: 24 (GT2)
- 2x 4K@60Hz support
- Hardware video decoding and encoding (4K@60, 10bit, H.264, HEVC, MJPEG, VP8/VP9)
    - HW Encode: MPEG2, AVC/H.264, VP8, JPEG, HEVC/H.265, VP9
    - HW Decode: MPEG2, VC1/WMV9, AVC/H264, VP8, JPEG/MJPEG, HEVC/H265 (10 bits & 8 bits), VP9
- Up to 64GB of video memory (limited to 45GB due to 96GB maximum memory configuration)
- Unified Memory Architecture

Detailed gen9.5 graphics architecture description:

```
https://en.wikichip.org/wiki/intel/microarchitectures/gen9.5
```

2.6 External connectors

2.6.1 Front connectors

#	Name	Description
1	Headphone output	3.5 mm jack (TRS) analogue stereo output jack sensing ALC892 codec
2	2x USB 3.2 gen 1	5 Gbps USB port, USB 3.2 gen 1 shared bandwidth (DMI limited) ASMEDIA ASM1042A root hub PCIe routed to PCH 5 VDC ± 5% / 0.9A Type A
3	Analogue line in	3.5 mm jack (TRS) analogue line input jack sensing ALC892 codec

Table 3. Front connectors

2.6.2 Rear connectors

#	Name	Description
1	2x HDMI 2.0	HDMI 2.0 output 4K@60Hz capable Connected via eDP to HDMI onboard converter
2	SPDIF / TOSLINK	Digital audio output TOSLINK optic fibre connector 660nm (nominal) LED transmitter Up to 12.5 Mbps / up to 10m
3	4x USB 3.2 gen 2	8 Gbps USB port, USB 3.2 gen 2 Shared bandwidth (DMI limited) PCH controller

4	4x USB 3.2 gen 2	8/10 Gbps USB port, USB 3.2 gen 2 5 VDC ± 5% / 0.9A Type A ASMEDIA ASM3142 PCIe routed to CPU via PCIe switch Independent bandwidth for each port. Bandwidth is limited to 16 Gbps (32Gbps total) for each pair of ports stacked with LAN. Each port can go up to 10 Gbps if second in pair is loaded below 6 Gbps. See details in block diagram.
5	2x LAN	Gigabit Ethernet (10/100/1000) RJ45 Wake-on-LAN support
6	Power input	19 VDC / 9.5A (max 13.0A) / ± 5% Barrel jack 5.5/2.5 (centre positive) 180W power rating

Table 4. Rear connectors

2.7 Internal connectors

2.7.1 Board layout

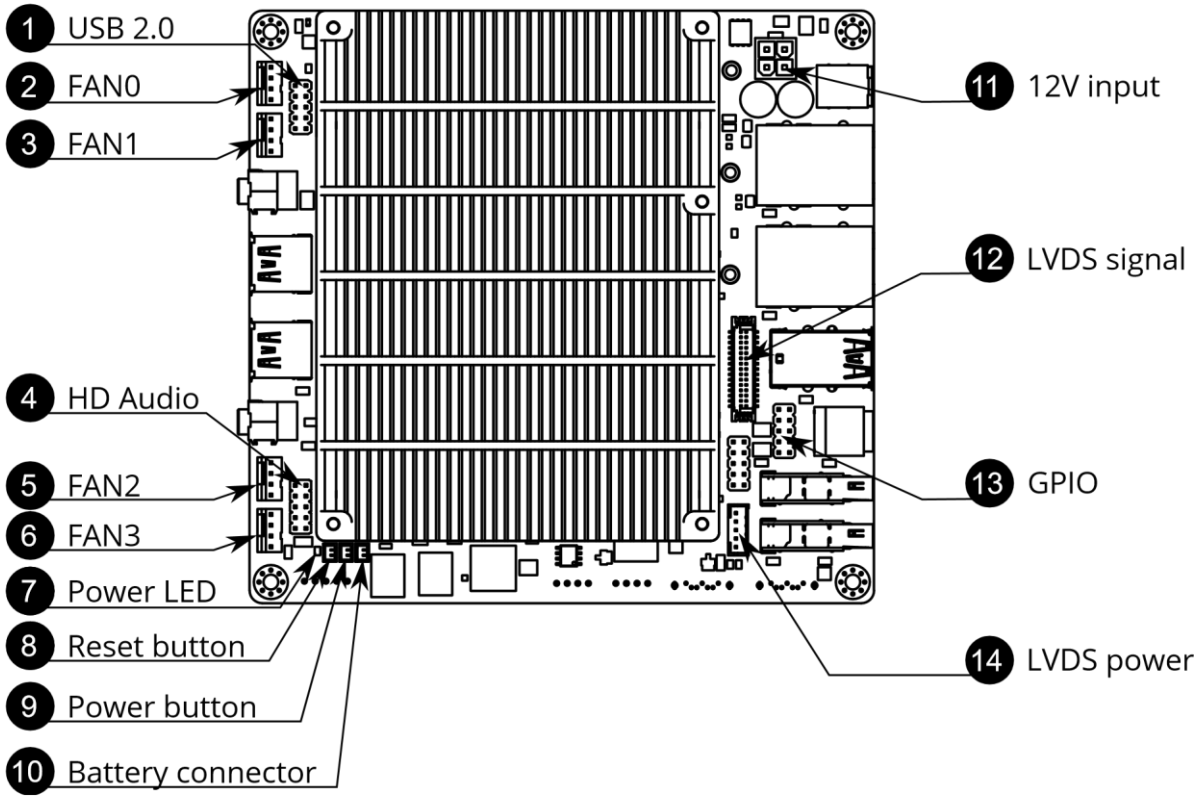


Figure 6. Internal connectors, top view

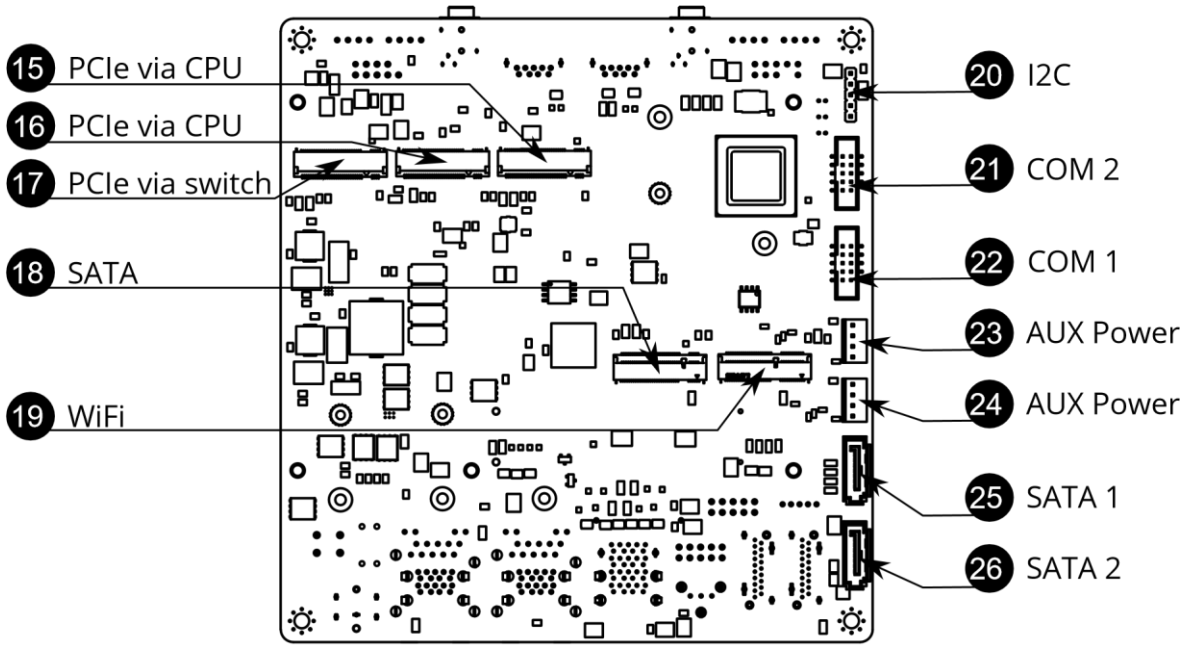


Figure 7. Internal connectors, bottom view

1. **USB 2.0 header, 9pin**

Full/High Speed, 5 VDC ± 5% / 0.5A, 9-pin header.

2. **Fan header, channel 0**

This header is controlled by SOM EC controller. It can be automatically adjusted to CPU temperature. Both channel 0 and channel 1 have duplicated PWM value and cannot be set independently. TACH signalling is handled via external fan controller and has to be accessed via SUSI-driver and customer software.

PWM controlled, 4pin fan header, 12VDC power. PWM 5.0 VDC level. Voltage controls is not supported.

3. **Fan header, channel 1**

This header is controlled by SOM EC controller. It can be automatically adjusted to CPU temperature. Both channel 0 and channel 1 have duplicated PWM value and cannot be set independently. TACH signalling is handled via external fan controller and has to be accessed via SUSI-driver and customer software.

PWM controlled, 4pin fan header, 12VDC power. PWM 5.0 VDC level. Voltage controls is not supported.

4. **HD Audio connector, 9pin**9-

   pin header, 2.54mm pitch.

5. **Fan header, channel 2**

This header is controlled by external EMC2305 fan controller. It cannot be automatically adjusted to CPU temperature. Both channel 0 and channel 1 have duplicated PWM value and cannot be set independently. TACH signalling is handled via external fan controller and has to be accessed via SUSI-driver and customer software.

PWM controlled, 4pin fan header, 12VDC power. PWM 5.0 VDC level. Voltage controls is not supported.

6. **Fan header, channel 3**

This header is controlled by external EMC2305 fan controller. It cannot be automatically adjusted to CPU temperature. Both channel 0 and channel 1 have duplicated PWM value and cannot be set independently. TACH signalling is handled via external fan controller and has to be accessed via SUSI-driver and customer software.

PWM controlled, 4pin fan header, 12VDC power. PWM 5.0 VDC level. Voltage controls is not supported.

7. **Power LED**

2-pin header, 2.54mm pitch, 3.3V powered.

8. **Reset button**

Micro JST 1.25 2-Pin Battery Connector

9. Power button

Micro JST 1.25 2-Pin Battery Connector

10. Battery connector

Micro JST 1.25 2-Pin Battery Connector

11. 12V ATX power input

12 VDC / 21.0 A / ± 10%, 4pin ATX connector

12. LVDS signal connectorDF13,

2x 15 pin.

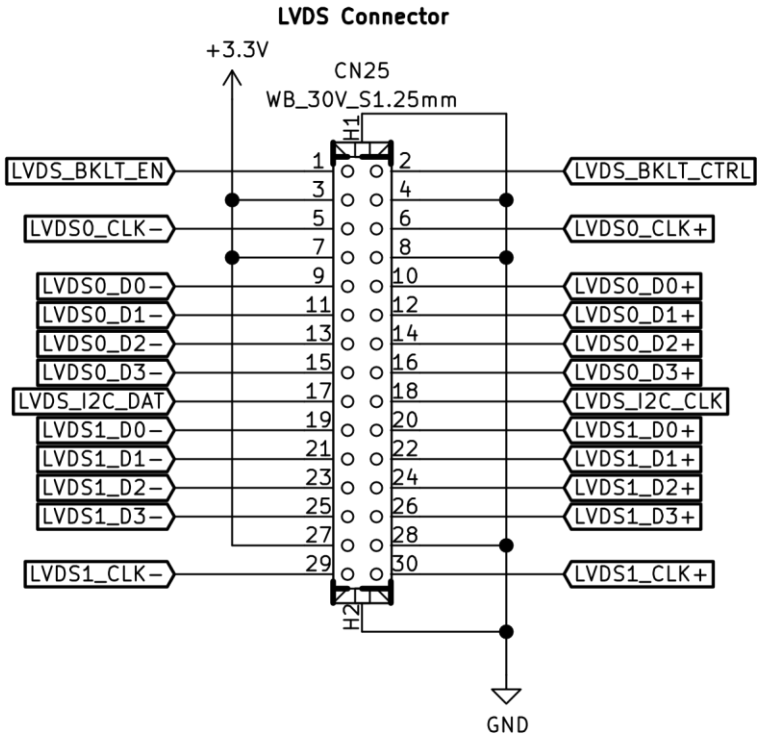


Figure 8. LVDS connector pinout

13. GPIO header

8x GPIO, 3.3 VDC level, 2x5-pin header, 2.00mm pitch

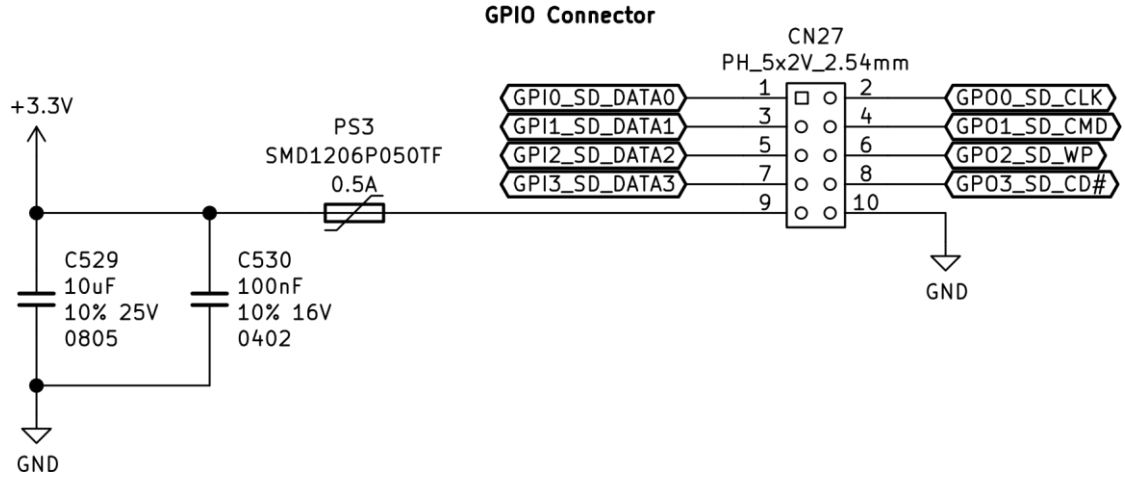


Figure 9. GPIO connector pinout

14. LVDS power connector

JST PH seriex 5pin connector (PHR-5-XX) (datasheet).

```
https://www.jst-mfg.com/product/pdf/eng/ePH.pdf
```

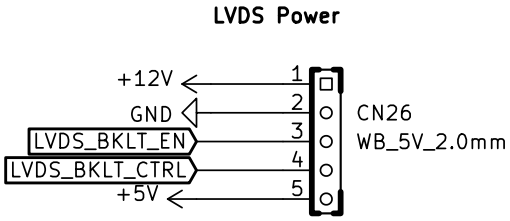


Figure 10. LVDS power connector pinout

15. M.2 expansion, M-key

4x PCIe 3.0, 32 GT/s, 1.6 / 6.6mm standoff, M-Key (PCIe 4x 3.0 only with backward compatibility). Connected directly to CPU (bifurcation 16x to 8x4x4x). See block diagram for more details.

Compatible with 2280 expansion cards only. Supports NVMe SSD boot.

16. M.2 expansion, M-key

4x PCIe 3.0, 32 GT/s, 1.6 / 6.6mm standoff, M-Key (PCIe 4x 3.0 only with backward compatibility). Connected directly to CPU (bifurcation 16x to 8x4x4x). See block diagram for more details.

Compatible with 2260 and 2280 expansion cards. Supports NVMe SSD boot.

17. M.2 expansion, M-key

4x PCIe 3.0, 32 GT/s, 6.6mm standoff, M-Key (PCIe 4x 3.0 only with backward compatibility). PCIe routed to CPU via PCIe switch (bifurcation 16x to 8x4x4x). Latency may be increased in some scenarios. See block diagram for more details.

Compatible with 2260 and 2280 expansion cards. Supports NVMe SSD boot.

18. M.2 expansion, B-key (SATA)

1x SATA 3.0, 6 Gb/s, 1.6 / 6.6mm standoff, B-Key (SATA only). Shared bandwidth (DMI limited), SATA routed to PCH.

Compatible with 2240/2242 and 2260 SATA SSD drives. Supports OS boot.

Populated with Advantech SQF-SM4V2-256G-SBC 256GB SATA SSD 2242 drive in default configuration.

19. M.2 expansion, E-key (WiFi)

1x PCIe 3.0, 8 GT/s / 1x USB2.0, 6.6 mm standoff, E-Key. Shared bandwidth (DMI limited). PCIe routed to PCH.
Compatible with 2230 wireless cards.

20. I²C header

3.3 VDC level, 5-pin header, 2.54mm pitch.

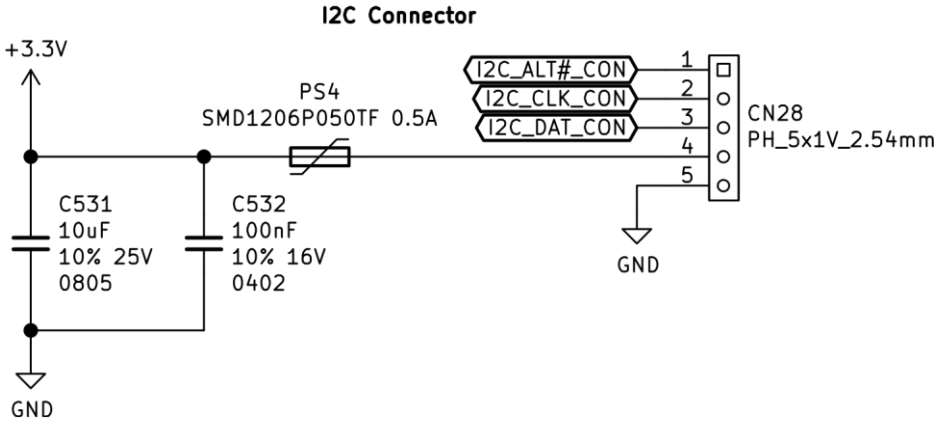


Figure 11. I2C connector pinout

21. UART (COM 2)

EIA-232, up to 115000 baud, 8-wire, EIA-232-C level, 2x5-pin header, 2.00mm pitch.

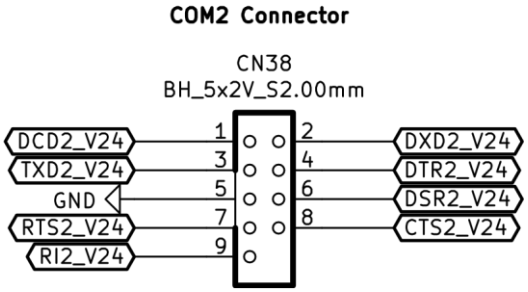


Figure 12. COM2 port connector pinout

22. UART (COM 1)

EIA-232, up to 115000 baud, 8-wire, EIA-232-C level, 2x5-pin header, 2.00mm pitch.

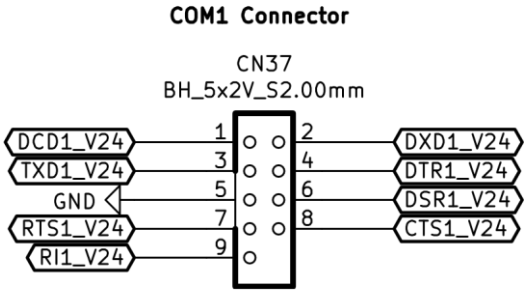


Figure 13. COM1 port connector pinout

23. AUX Power

Switched 12 VDC / 1A (minus switch losses). 5 VDC ± 5% / 1A. Current limit is shared between both internal power outputs for each voltage. ATX Molex Mini floppy connector.

Power Out 1

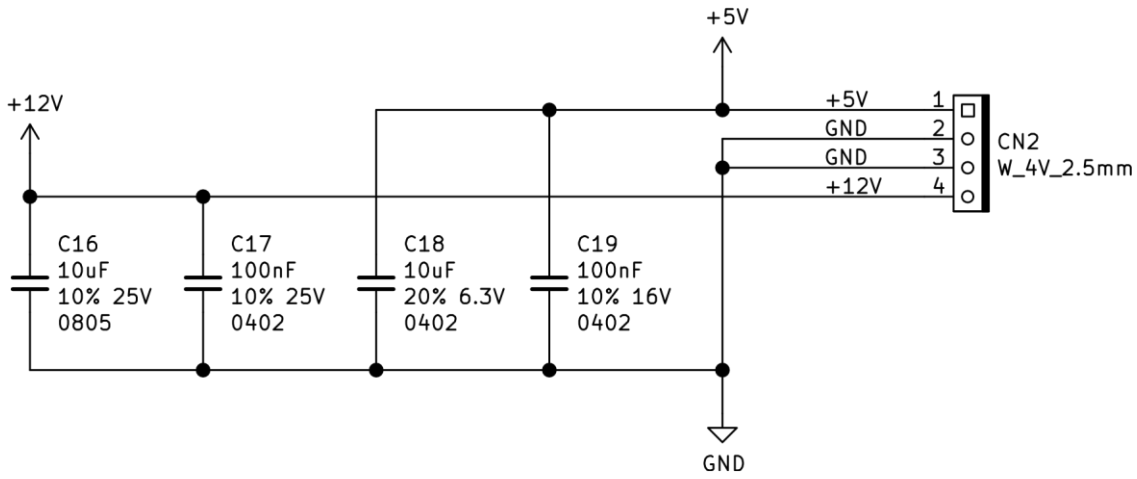


Figure 14. AUX power 1 port connector pinout

24. AUX Power

Switched 12 VDC / 1A (minus switch losses). 5 VDC ± 5% / 1A. Current limit is shared between both internal power outputs for each voltage. ATX Molex Mini / berg floppy connector.

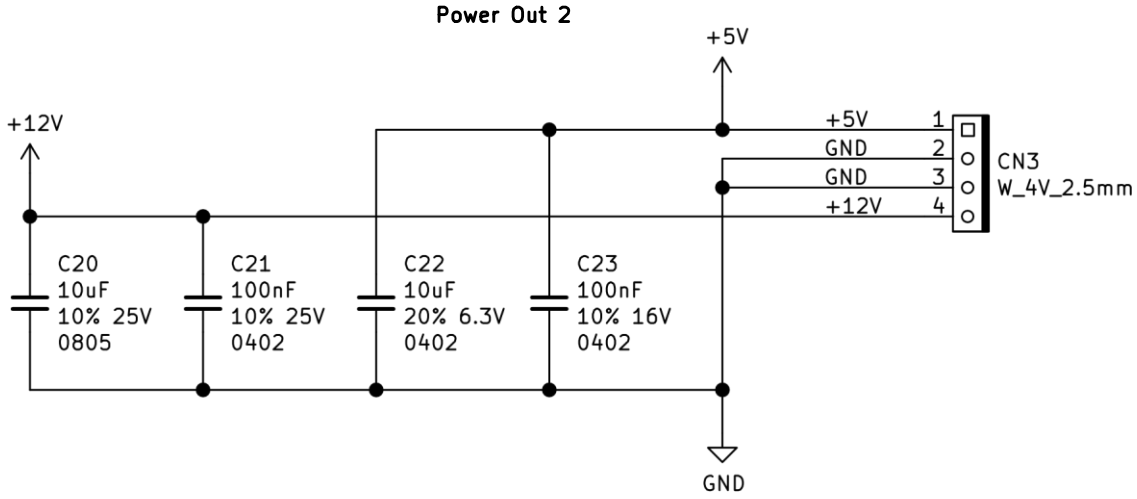


Figure 15. AUX power 2 port connector pinout

25. SATA 1

Gen3 up to 6 Gbps.

26. SATA 2

Gen3 up to 6 Gbps.

2.7.2 Thermal control

Thermal control system main features implemented on BIVROST® Lite5 Platform:

- Thermal control for Fan 0 & 1 is based on the temperature of the hottest element: Intel CPU.
- EC drives FAN 0&1 in parallel according to fan curve.
- Fan 0&1 TACH signal is monitored from external Fan controller.
- Fan curve is adjustable via software, changes apply on-the-fly but they are not stored permanently (resets during power cycle to default curve).
- Thermal control for Fan 2&3 is based on a separate Fan controller/monitor Microchip EMC2305 and can be programmed out from OS (Windows 10)/SUSI via SMBus.

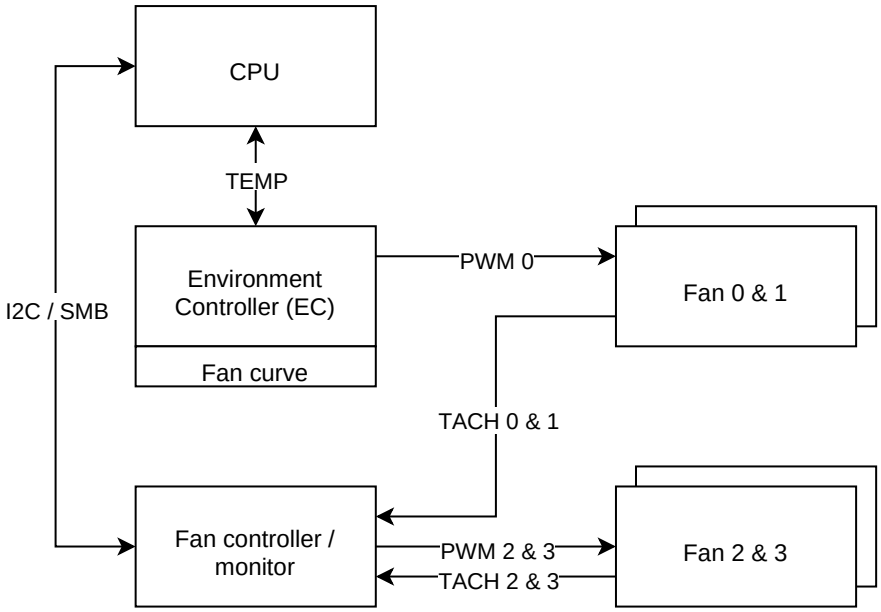


Figure 16. Thermal control diagram

EMC 2305 can be downloaded from:

```
https://ww1.microchip.com/downloads/en/DeviceDoc/2305.pdf
```

3. OS compatibility

This board is designed to be fully compatible with:



All trademarks are property of their respective owners.

All Windows 10 versions are supported. Ubuntu Linux was tested to be compatible with version 18.10 and above - previous versions may work but are not officially supported.

OS installation should not require additional driver setup. All drivers are included within basic OS installation or supported with automatic driver installation (Windows Update).

It is recommended to use Intel® Driver & Support Assistant to get latest versions of Intel hardware drivers on Windows 10. Intel® Driver & Support Assistant may be downloaded from:

```
https://downloadcenter.intel.com/download/28425/Intel-Driver-Support-Assistant
```

⚠ GPU performance may be degraded with 4K display when using older Ubuntu Linux distributions due to kernel driver not being fully optimized and Gnome Desktop software.
Additional virtual driver for SUSI software needs manual installation. Driver can be downloaded from:

```
https://www.advantech.com/support/details/software%20api?id=1-1NWNAIX
```

SUSI software provides additional hardware monitoring features and easy access to GPIO, I^2C, Fan control and SMBus. Examples and source code are included in the package.

4. Dimensions

Physical carrier board and SOM module dimensions.

All dimensions are given in millimetres.

Complete CAD files package can be downloaded from:

```
https://bivrost.pro/Lite5_CAD.zip
```

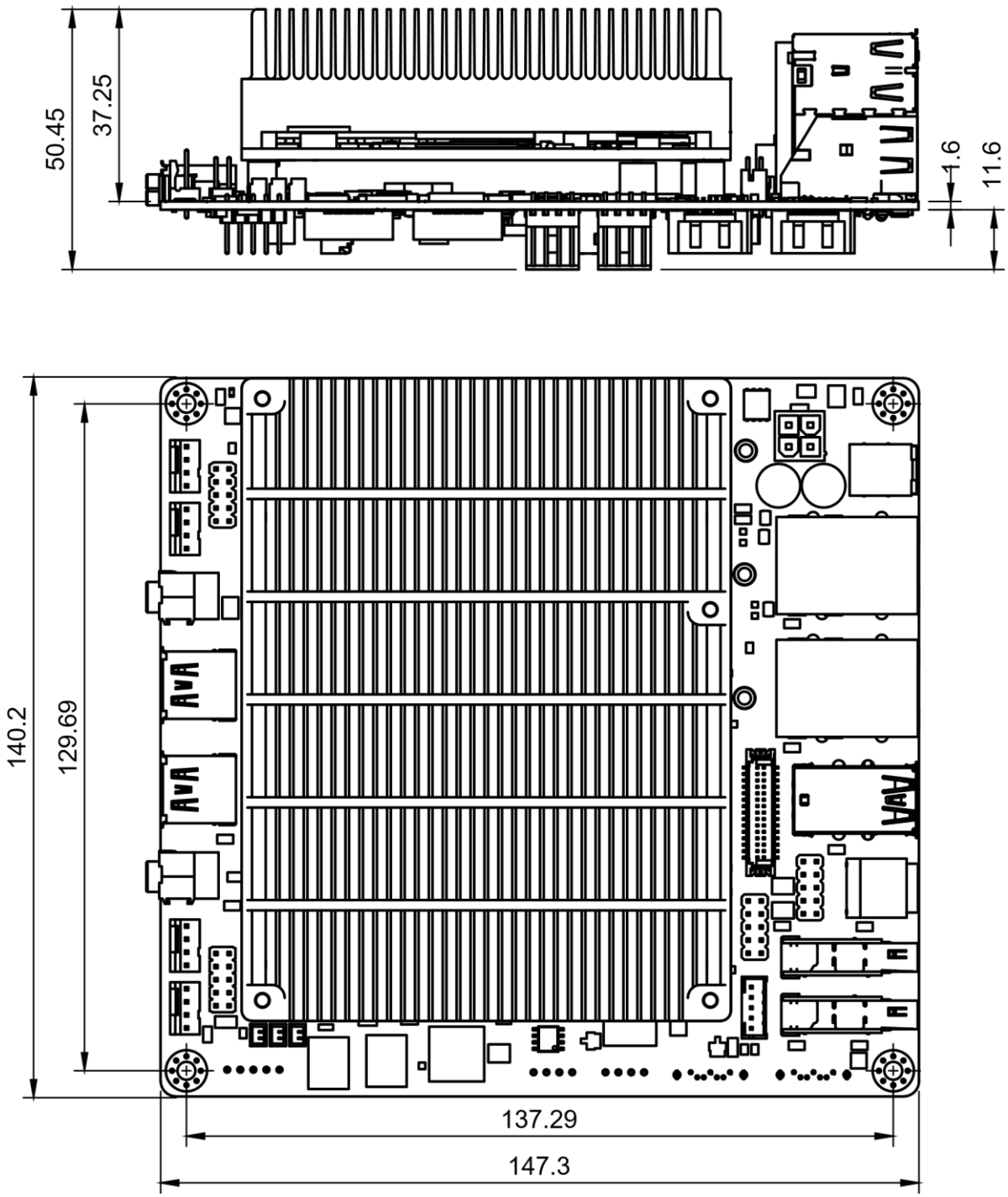


Figure 17. Platform dimensions

5. Reference chassis

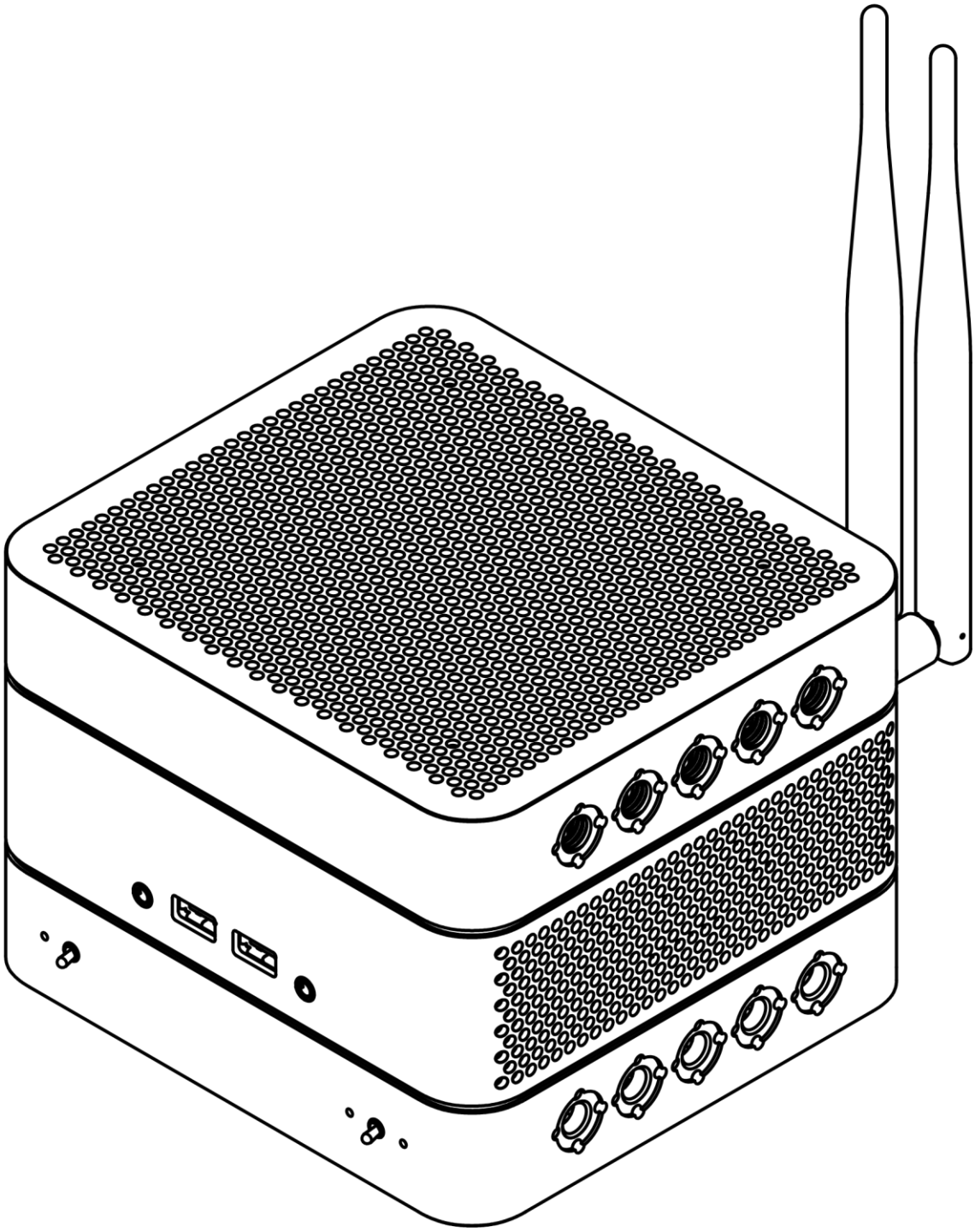


Figure 18. Reference Platform Chassis

5.1 Dimensions

Bottom and front view. All dimensions are given in millimetres.

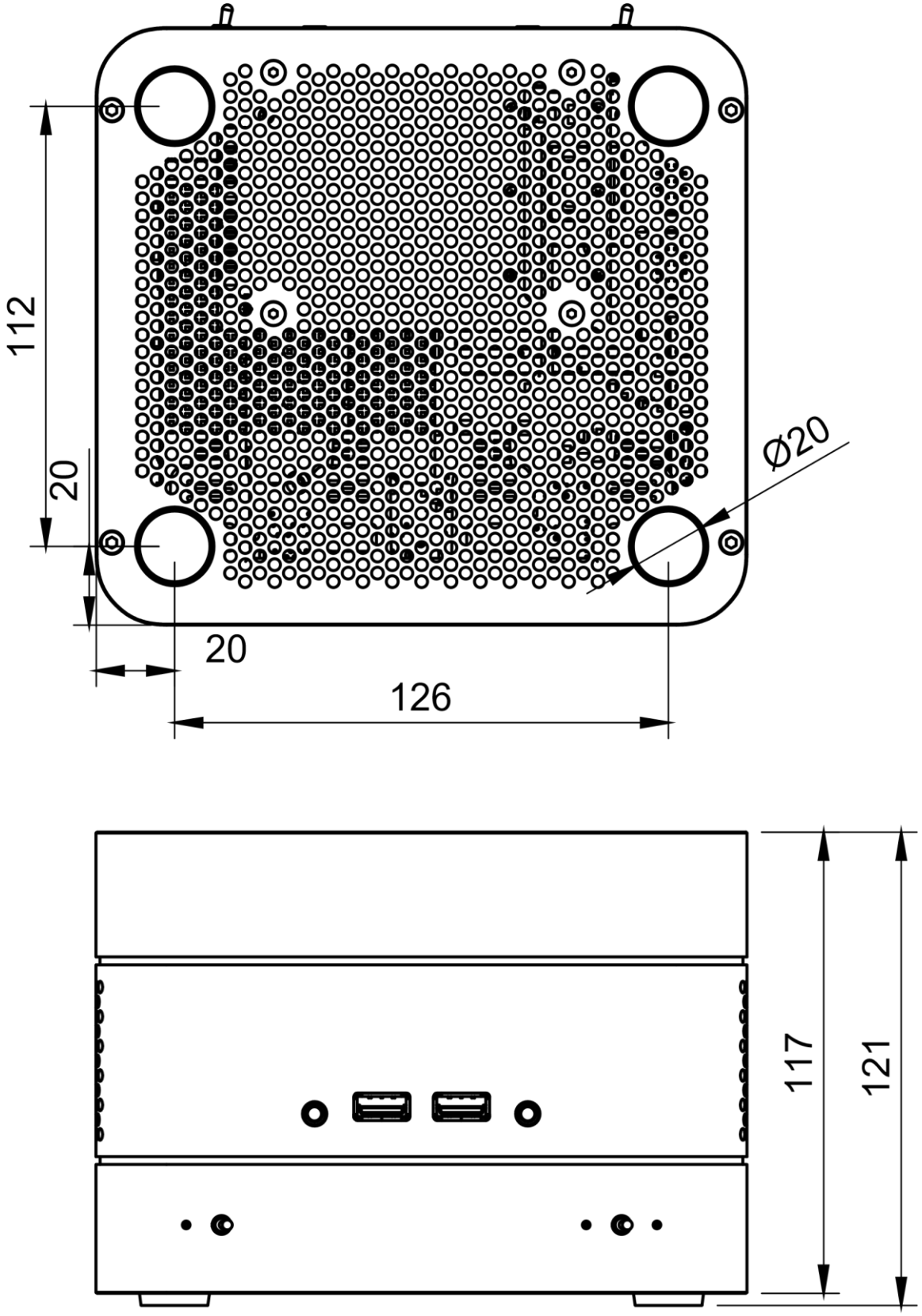


Figure 19. Reference chassis dimensions

5.2 Design concepts

Reference chassis for BIVROST® Lite5 Platform has been engineered as a high-bandwidth video capture and mixing station.

Chassis includes high flow / low RPM single fan for efficient and quiet operation necessary in video production environments not to interfere with recording scenes. Effective cooling is crucial to achieving predictable performance for real-time video processing and other time-critical applications.

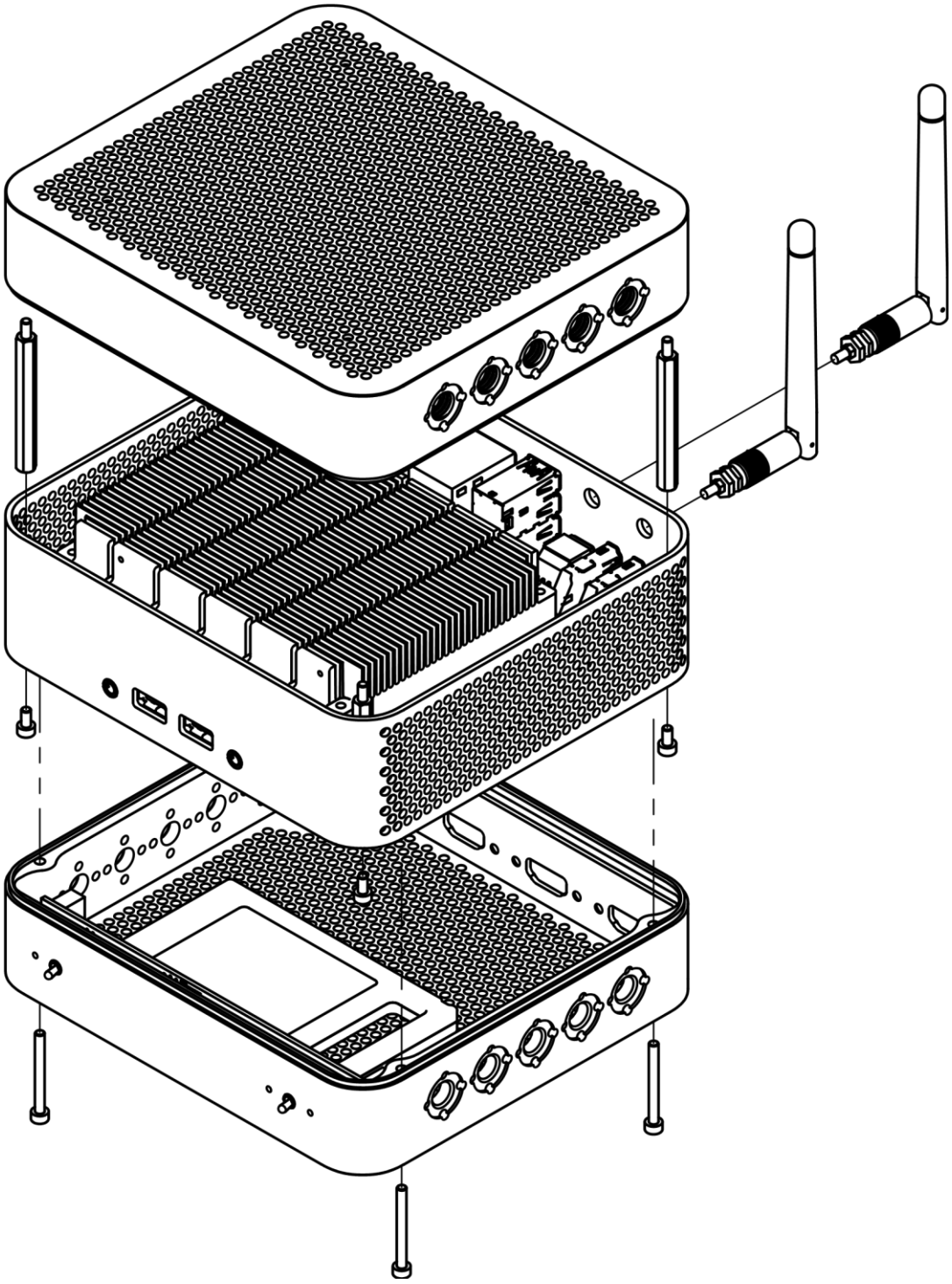


Figure 20. Reference chassis sections overview

Key chassis features

- Quiet and effective cooling
- No thermal throttling under sustained load
- Up to 4 video inputs (HDMI or SDI) or other additional data input in bottom slice
- Dual WiFi antennas
- 2.5" drive mount
- Integrated ARRI 3/8" mounting points for additional accessories
- Front panel with two customizable function buttons and LED indicators
- Programmable RGB lighting integrated in cooling system, power indicator and custom functions indicators with full RGB control and animations Anodized black coating

5.3 Cooling

Reference chassis uses one 120mm PWM controlled fan with programmable RGB lighting.

Available airflow keeps temperatures below the thermal throttling threshold.

Cold air intake is placed on top of the chassis. Air is pushed through heatsink and along heatsink fins, blown out through perforated sides of the device.

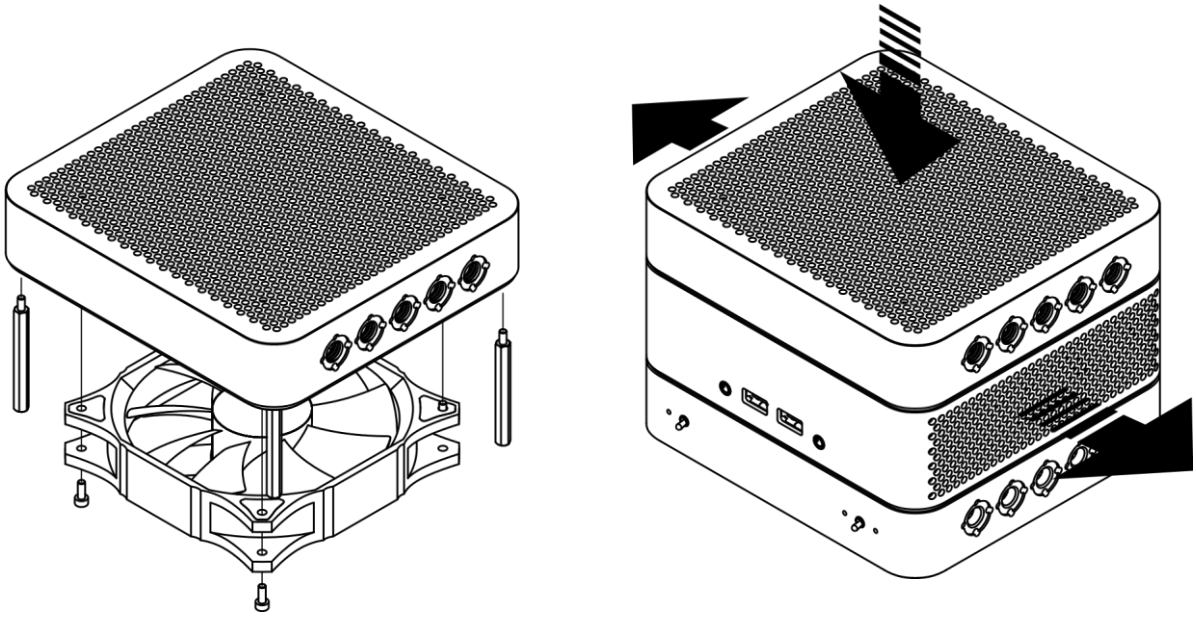


Figure 21. Cooling airflow

Fan speed is controlled by EC built-in compute module according to fan curve. The curve can be changed via software on the fly. Job profiles can be applied to balance between silent operation and getting maximum performance (highest sustained CPU turbo clocks). The default curve values are stored in firmware and cannot be changed permanently to avoid long term overheating. Fan curve resets to device default values every device power cycle.

6. Tips and quirks

- Internal USB header is powered even if system is off (power supply connected).
- There are 4 USB 3.2 gen 2 ports with dedicated bandwidth connected to CPU for reduced latency and maximum performance with ASM3142 root hubs. Each pair located in a small tower with LAN connector is wired to one ASM3142 chip.
- Each ASM3142 chip is connected to CPU with 2 PCIe lanes with 16GT/s overall speed which limits USB ports speed to ~8Gbps if both ports are under full load. Each port is capable of reaching 10Gbps if 16GT/s PCIe link is not saturated.
- GPU performance may be limited on 4K displays when using older Ubuntu Linux distributions due to kernel driver not being optimized and Gnome Desktop software.
- Three M.2 ports may be used for high resolution image capture with dedicated video capture cards as they have dedicated PCIe lanes wired to CPU (directly or via PCIe switch).
- AUX power outputs can be used to power SATA drives. Power limit of 1A is rated for 5V and 12V separately but it is shared between both outputs per each voltage.
- BIOS is preconfigured for optimal operation. No option except BOOT order should be configured by user.

7. Packing list and accessories

BIVROST® Lite5 Platform base components.

Lite5 i7

Part No.	Description	Quantity
EBC-DC17-10A1 SOM-5899C7Q-U6A1	Advantech SOM-5899 CPU Module	1
1960073941T051	Heatsink	1
SQR-SD4N8G2K6SNBCB	8GB DDR4 2666 RAM Module	2
EBC-DC17-00A1	BIVROST® Lite5 Carrierboard	1
SQF-SM4V2-256G-SBC	Advantech M.2 2242 256GB SATA SSD	1

Table 5. BIVROST® Lite5 Platform i7 version packing list

Lite5 i5

Part No.	Description	Quantity
SOM-5899C5Q-U5A1	Advantech SOM-5899 CPU Module	1
1960073941T051	Heatsink	1
SQR-SD4N8G2K4SNBBB	8GB DDR4 2400 RAM Module	2
EBC-DC17-00A1	BIVROST® Lite5 Carrierboard	1
Part No.	**Description**	**Quantity**
SQF-SM4V2-256G-SBC	Advantech M.2 2242 256GB SATA SSD	1

Table 6. BIVROST® Lite5 Platform i5 version packing list

Optional accessories

Part No.	Description
EWM-W163M201E	Advantech M.2 WiFi+Bluetooth Card Atheros QCA6174A 2x2 802.11ac
1750007965-01	WiFi Coaxial Cable, SMA (M) to MHF4, 30 mm
1750002842	WiFi 2.4 GHz and 5 GHz dipole Antenna
SQF-CM8V4-1K9G-ECC	Advantech M.2 2280 1.9TB NVMe SSD

Table 7. Optional accessories

8. Legal

BIVROST® Lite5 Platform may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata, if any, are documented in this product specification.

For information about any Regulatory Compliance please contact support@bivrost.pro.

Keep in mind this document describes engineering sample specifications that may be subject to change. BIVROST® Lite5 Platform is not intended for customer use.

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