Arena-Pine Technical Product Specification

NUC13ANFv7

NUC13ANFi7

NUC13ANFi5

NUC13ANFi3

Version .1, 04/6/2023

Preface

The purpose of this document is to provide a technical reference for customers and developers of the Simply NUC Arena-Pine family of products. Arena-Pine kit SKUs include NUC13ANFv7, NUC13ANFi7, NUC13ANFi5, and NUC13ANFi3.

Contents

Tables

Figures

1   Description

1.1   Overview

The Simply NUC Arena-Pine is a fanless NUC with rich IO and a powerful 13th gen Intel processor. This device is capable of running in most industrial environments with ease.

Arena-Pine has the following features:

- Intel® Core™ i7-1370P, i7-1360P, i5-1350P, i5-1340P, or i3-1315U
- Intel® UHD Graphics P750, Intel Iris Xe , or Intel® UHD Graphics (Processor dependant)
- Two DDR4-3200 SO-DIMM Sockets
- M.2 Slot for PCIe Gen4 x4 for SSD
- Two M.2 Slot for Wi-Fi/ Bluetooth Radio
- One DisplayPort (4k, 60Hz)
- Two HDMI Ports (4k, 60Hz)
- Two Rear USB 3.2 Gen 2 Type-C Ports (supporting DP Alt Mode)
- Two Front USB 3.2 Gen 2 Type-A Ports
- One Rear USB 3.2 Gen 2 Type-A Port
- One Rear USB 2.0 Gen 2 Type-A Port
- 3.5mm Combination Microphone/Headphone Jack
- Internal SATA III Connector
- Internal Dual USB 2.0 Header
- Simply NUC Fanless Chassis
- 19VDC 65W Power Supply Adapter
- 12V – 19V Input Power Supply Range

1.2   Processor

The Arena-Pine CPUs have the following features

Table 1: CPU Features

Arena-Pine	NUC13ANFv7	NUC13ANFi7	NUC13ANFi5	NUC13ANFi3
Intel CPU	i7-1370P	i7-1360P	i5-1340P	i3-1315U
Performance Cores	4	4	4	2
Efficiency Cores	8	8	8	4
Total Cores	12	12	12	6
Threads	16	16	16	8

Arena-Pine	NUC13ANFv7	NUC13ANFi7	NUC13ANFi5	NUC13ANFi3
L1 P Cache	4 x 32KB + 4 x 48KB	4 x 32KB + 4 x 48KB	4 x 32KB + 4 x 48KB	2 x 32KB + 2 x 48KB
L1 E Cache	8 x 64KB + 8 x 32KB	8 x 64KB + 8 x 32KB	8 x 64KB + 8 x 32KB	4 x 64KB +4 x 32KB
L2 Cache	4x 1.25 + 2x 2MB	4x 1.25 + 2x 2MB	4x 1.25 + 2x 2MB	2x1.25MB
L3 Cache	18MB Unified	18MB Unified	12MB Unified	10MB Unified
Base Speed (Turbo) [MHz]	1300 (4800)	1200(4400)	1300(3800)	1000(3200)
TDP (Configurable)[W]	28	28	28	15
Integrated Graphics	Intel® Iris® Xe Graphic	Intel® Iris® Xe Graphic	Intel® Iris® Xe Graphics	Intel® UHD Graphics

1.3   Integrated Graphics Processing Unit

The Arena-Pine CPU has an integrated Intel graphics processing unit with the following features.

Table 2: GPU Features

Arena-Pine	NUC13ANFv7	NUC13ANFi7	NUC13ANFi5	NUC13ANFi3
GPU	Intel® UHD Graphics P750	Intel® Iris® Xe Graphic	Intel® Iris® Xe Graphics	Intel® UHD Graphics
Graphics Max Dynamic Frequency	1.30 GHz	1.50 GHz	1.45 GHz	1.25 GHz
Execution Units	32	96	80	64
4K Support	Yes, at 60Hz	Yes, at 60Hz	Yes, at 60Hz	Yes, at 60Hz
Maximum Resolution (HDMI)	4096x2160 @60Hz	4096x2160 @60Hz	4096x2160 @60Hz	4096x2160 @60Hz
Max Resolution (DP)	5120 x 3200 @60Hz	7680 x 4320 @ 60Hz	7680 x 4320 @ 60Hz	7680 x 4320 @ 60Hz
Max Resolution (DP)	5120 x 3200 @60Hz	4096 x 2304 @ 120Hz	4096 x 2304 @ 120Hz	4096 x 2304 @ 120Hz
DirectX* Support	12.1	12.1	12.1	12.1

Arena-Pine	NUC13ANFv7	NUC13ANFi7	NUC13ANFi5	NUC13ANFi3
OpenGL* Support	4.5	4.5	4.5	4.5
OpenCL* Support	3.0	3.0	3.0	3.0

1.4   Memory

Arena-Pine has two 260-pin 1.2 V DDR4 SDRAM SODIMMS

sockets:

- Support for DDR4 2400/2666/3200 MHz SO-DIMMs
- Support for 8 Gb and 16 Gb technology
- Support for up to 64 GB of system memory with two SO-DIMMs using 32 GB memory modules
- Support for non-ECC memory
- Support for 1.2 V JEDEC memory only

1.5   Storage

One M.2 PCIe Gen4 connector supporting M.2 22x80 (key type M) for NVMe only

One M.2 connector supporting M.2 22x42 (key type B) for SATA SSD, PCIe x1 or USB 3.2

expandability. One SATA 6.0 Gb/s combined data and power connector for 2.5 inch HDD

1.5.1   SATA Interface

The SATA III port has a theoretical maximum transfer rate of 8Gbps.

1.5.2   PCIe Interface

The M.2 slot is a key-M slot for an PCIe 2280 M.2 module, up to 8TB in density. The PCIe 4.0 x4
 interface on the port has a theoretical maximum transfer rate of 8GBps.

1.6   Networking

1.6.1   RJ-45 Connectors for Networking Interface (LAN1/LAN2)

Arena-Pine has dual Intel I226LM(i7 and v7) or I226-V (all other processor variants) 2.5 gigabit ethernet
controllers that interfaces to on-board RJ-45 Ethernet connectors (LAN1/LAN2) to provide 2.5 gigabit
Ethernet connections. The I226LM controller features:

- Integrated MAC + BASE-T PHY.
- MDI (Copper) standard IEEE 802.3 Ethernet interface for 2500BASE-T, 1000BASE-T, 100BASE-TX,
  and 10BASE-TE applications (802.3, 802.3u, 802.3bz, and 802.3ab).
- MDI lane swap.

- IEEE 802.3 auto-negotiator.
- IEEE 802.3x and IEEE 802.3z compliant flow control support with software-controllable Rx thresholds and Tx pause frames.
- Automatic crossover detection function (MDI/ MDI-X).
- IEEE 1588 protocol and 802.1AS implementation.
- Supporting Time Sensitive Networking (TSN) Capabilities (IEEE 802.1Qbu, 802.3br, 802.1Qbv, 802.1AS-REV, 802.1p, Q, and 802.1Qav).
- Supports IEEE 802.3az – Energy Efficient Ethernet (EEE).
- Smart Power Down (SPD) at S0 no link/Sx no link.
- Full wake up support (APM and ACPI).
- MAC Power Management controls.
- Power Management Protocol Offload (Proxying).
- Latency Tolerance Reporting (LTR.)
- TCP/UDP, Ipv4 checksum offloads (Rx/ Tx).
- Transmit Segmentation Offloading (TSO) (Ipv4, Ipv6).
- Legacy, Message Signal Interrupt (MSI) and Message Signal Interrupt Extension (MSI-X).
- Support for packets up to 9.5 KB (Jumbo Frames).
- Descriptor ring management hardware for Transmit and Receive.

1.6.2 Wireless Networking Interface

- 2.4Ghz, 5Ghz, and 6E support.
- Maximum bandwidth of 2.4Gbps
- 2x2 transmit/receive streams.
- Supports IEEE WLAN standards IEEE 802.11a/b/d/e/g/h/i/k/n/r/u/v/w/ac/ax
- Supports authentications WPA and WPA2, 802.1X EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0-MSCHAPv2 (EAP-SIM, EAP-AKA, EAP-AKA')
- 64-bit and 128-bit WEP,TKIP, 128-bit AES-CCMP, 256-bit AES-GCMP encryption supported
- Bluetooth® 5.2, BLE.

2 Technical Reference

2.1 Motherboard Headers

2.1.1 Headers – Top of Board

Headers on the top side of the motherboard are defined below.
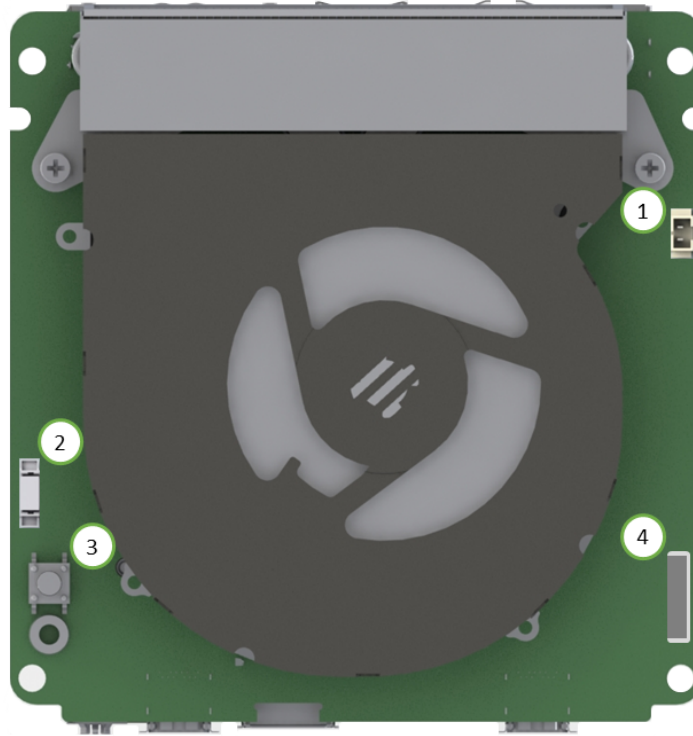
Figure 1: Top Side Header Locations

Table 3: Top Side Header Definitions

Identifier	Header
1	Battery Header
2	APU Fan Header
3	Power Button
4	eSPI Connector

2.1.1.1   Battery Header

The battery header is a 1.25mm, 1×2 2-circuit, male header. The battery header is an input power supply from a coin-cell battery to power CMOS memory.

2.1.1.2   APU Fan Header

The APU fan header is a 1.25mm, 1×4 4-circuit, male header. The header is for a CPU cooling fan that can be speed detected and controlled, as well as displayed in the Hardware Monitor section of the BIOS.

Table 4: CPU Fan Header Pinout

Pin	Signal Definition
1	GND
2	5V
3	Fan Speed
4	Fan Speed Control

2.1.1.3   Power Button

The power button on the APU side of the Arena-Pine board can be used to power on and off the system in the absence of a Power-ON solution via the Front Panel header.

2.1.1.4   eSPI Connector

eSPI is an all-in-one bus that was designed to replace the LPC bus as well as the SPI bus, SMbus and sideband signals.

2.1.2 Headers – Bottom of Board

The headers on the top side of the motherboard are defined below.
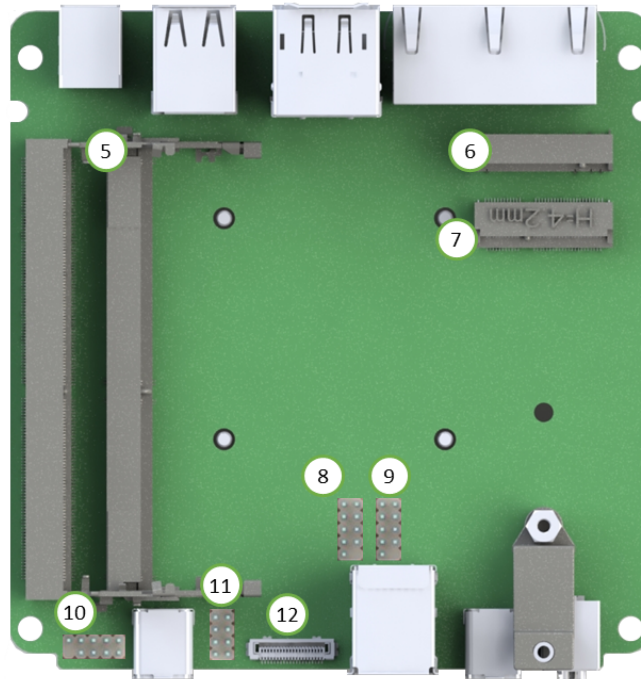
Figure 2: Bottom Side Header Locations

Table 5: Bottom-Side Header Definitions

Identifier	Header
5	DDR4 SO-DIMM Socket
6	M.2 for Storage
7	M.2 for Radio
8	COM Header
9	USB2 Header
10	Front Panel Header
11	ATX/AT & Clear CMOS Jumper
12	SATA-III Connector

2.1.2.1 DDR4 SO-DIMM Sockets

The Arena-Pine motherboard has two 260-pin SO-DIMM sockets for DDR4 memory and supports the following features:

- 1.2v DDR4 DIMMs with dual channel architecture
- DDR4-3200 speeds for a peak transfer rate of 25600MBps
- Non-CC, Unbuffered, single- or dual-sided SO-DIMMs
- 4GB to 64GB of total system memory
- Serial Presence Detect (SPD)
- DDR4 SDRAM organizations 1Rx8, 1Rx16 and 2Rx8 supported

2.1.2.2 M.2 for Storage

The M.2 storage socket supports PCI Express (PCIe) drives in a 2280 key-M module. PCIe drives utilizing PCIe Gen 4 can deliver up to 8GBps bandwidth.

Table 6: M.2 Key-M SSD Pinout

Pin	Signal	Signal	Pin
74	3.3V	GND	75
72	3.3V	GND	73
70	3.3V	GND	71
68	N/A	PEDET	69
66	CONNECTOR KEY	N/A	67
64	CONNECTOR KEY	CONNECTOR KEY	65
62	CONNECTOR KEY	CONNECTOR KEY	63
60	CONNECTOR KEY	CONNECTOR KEY	61
58	N/A	CONNECTOR KEY	59
56	N/A	GND	57
54	WAKE#	PEFCLKp	55
52	CLKREQ#	PEFCLKn	53
50	PERST#	GND	51
48	N/A	PETp0	49

Pin	Signal	Signal	Pin
46	N/A	PETn0	47
44	N/A	GND	45
42	SMB_DATA	PERp0	43
40	SMB_CLK	PERn0	41
38	N/A	GND	39
36	N/A	PETp1	37
34	N/A	PETn1	35
32	N/A	GND	33
30	N/A	PERp1	31
28	N/A	PERn1	29
26	N/A	GND	27
24	N/A	PETp2	25
22	N/A	PETn2	23
20	N/A	GND	21
18	3.3V	PERp2	19
16	3.3V	PERn2	17
14	3.3V	GND	15
12	3.3V	PETp3	13
10		PETn3	11
8	N/A	GND	9
6	N/A	PERp3	7
4	3.3V	PERn3	5
2	3.3V	GND	3
		GND	1

2.1.2.3   M.2 for Radio

The M.2 radio socket supports a wireless radio in a 2230 key-E module. The system includes an Intel AX200 dual-band Wi-Fi 6/Bluetooth v5.2 radio which can be removed, if necessary.

Table 7: M.2 Key-E Pinout

Pin	Signal	Signal	Pin
74	3.3V	GND	75
72	3.3V	GND	73
70	3.3V	GND	71
68	N/A	PEDET	69
66	CONNECTOR KEY	N/A	67
64	CONNECTOR KEY	CONNECTOR KEY	65
62	CONNECTOR KEY	CONNECTOR KEY	63
60	CONNECTOR KEY	CONNECTOR KEY	61
58	N/A	CONNECTOR KEY	59
56	N/A	GND	57
54	WAKE#	PEFCLKp	55
52	CLKREQ#	PEFCLKn	53
50	PERST#	GND	51
48	N/A	PETp0	49
46	N/A	PETn0	47
44	N/A	GND	45
42	SMB_DATA	PERp0	43
40	SMB_CLK	PERn0	41
38	N/A	GND	39
36	N/A	PETp1	37
34	N/A	PETn1	35

Pin	Signal	Signal	Pin
32	N/A	GND	33
30	N/A	PERp1	31
28	N/A	PERn1	29
26	N/A	GND	27
24	N/A	PETp2	25
22	N/A	PETn2	23
20	N/A	GND	21
18	3.3V	PERp2	19
16	3.3V	PERn2	17
14	3.3V	GND	15
12	3.3V	PETp3	13
10		PETn3	11
8	N/A	GND	9
6	N/A	PERp3	7
4	3.3V	PERn3	5
2	3.3V	GND	3
		GND	1

2.1.2.4 COM Header

The COM header is a 2.00mm, 2×5 9-circuit, male header. This header is intended to connect to a serial RS-232 interface.
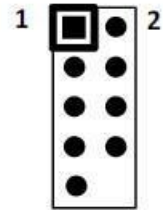

Figure 3: COM Header

Table 8: COM Header Pinout

Pin	RS-232 Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI#
10	Empty

2.1.2.5   USB 2.0 Header

The motherboard has one on-board 2.00mm, 2×5 9-circuit, male header that can be used to connect to two external USB 2.0 devices.
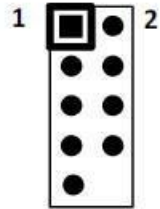

Figure 4: USB 2.0 Header

Table 3: USB 2.0 Header Pinout

Pin	Signal
1	VCC
2	VCC
3	USB0-
4	USB1-
5	USB0+
6	USB1+
7	GND
8	GND
9	No Connect
10	Empty

2.1.2.6   Front Panel Header

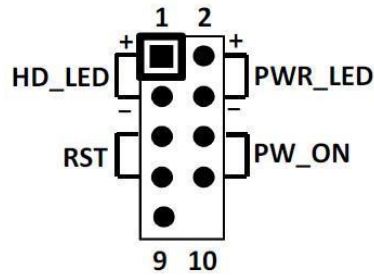The front panel header is a 2.00mm, 2×5 9-circuit, male header. It connects to the front panel switches and LEDs.

Figure 5: Front Panel Header

Table 4: Front Panel Header Pinout

Pin	Header	Signal
1	HD_LED	HD_PWR
3		HD_Active
2	PWR_LED	PWR LED+
4		PWR LED-
5	RESET	GND
7		RST BTN
6	PW_ON	PWR BTN
8		GND
9	No Connect	+5V
10	Empty	Empty

The HD_LED pins attach to a hard disk drive indicator LED to show the activity status of the hard disks.

The Power LED lit by the PWR_LED pins indicates the status of the system.

<p style="text-align: center">Table 5: Power LED System Status</p>

System Status	Power LED status
S0	LED is on
S1	LED will blink
S3	LED is off
S4	LED is off
S5	LED is off

The RESET pins attach to a front panel RESET switch to restart the system when the switch is pressed.

The PW_ON pins attach to the front panel Power switch to turn the system on and off when the switch is pressed.

2.1.2.7 ATX/AT & Clear CMOS Jumper

The motherboard has a 2.54mm, 2×4 8-circuit, male header for a 2-pin jumper that can be used to clear the CMOS data and reconfigure the system back to the default values stored in the ROM BIOS.
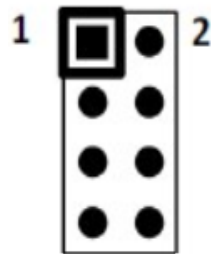
1-2: SIO AT Mode
(Default Open: SIO ATX Mode)
4-6: Clear CMOS
3-4: Auto Clear CMOS
5-7: DACC*

2.1.2.8   SATA-III Connector

The motherboard has a 0.5mm 20-pin WTB LVDS connector with which to attach a SATA-III storage device.

Figure 6: SATA Connector

Table 6: SATA Connector Pinout

Pin	Signal
1	GND
2	TX+
3	TX-
4	GND
5	GND
6	RX-
7	RX+
8	GND
9	GND
10	GND
11	No Connect
12	5V
13	5V
14	5V
15	5V
16	5V
17	No Connect
18	GND
19	GND
20	GND

2.2 Chassis I/O Connectors

2.2.1 Connectors – Front Panel

Front-side connector locations are shown below.

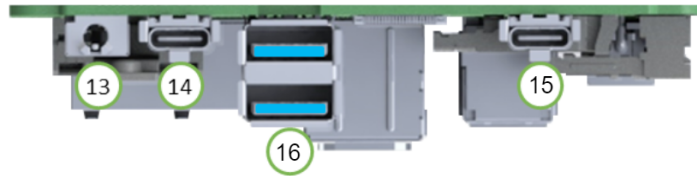**Figure 7: Front Side Connector Locations**

Table 7: Front Side Connections Defined

Identifier	Connector
13	Audio Jack
14	USB 3.2 Gen2 Type-C
15	Thunderbolt 4 Type-C Port
16	Dual USB 3.2 Gen2 Type-A

The 3.5mm audio jack supports two-channel high-definition audio output and microphone input, adhering to both TRRS (CTIA/AHJ and OMTP) standards. The hardware is capable of auto-detecting the TRRS standard used.

The front board of the Arena-Pine includes two USB 3.2 Gen2 ports: one Type-A and one Type-C. These ports offer transfer speeds of up to 10Gbps. The dual Type-C ports also support DP 1.4 via DP Alt Mode and Thunderbolt 4, enabling display output with a maximum resolution of 4096×2160 at 60Hz.

2.2.2 Connectors – Rear Panel

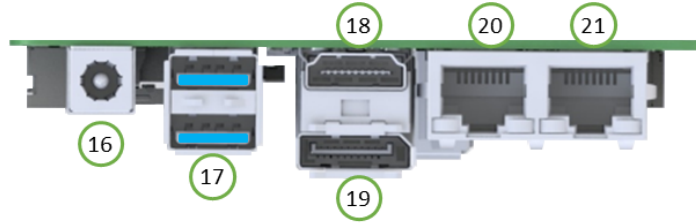Connector locations shown on the back side of the motherboard are shown below.

Figure 8: Back Side Connector Locations

Table 8: Back Side Connections Defined

Identifier	Connector
16	DC Power Input
17	Dual USB 3.2 Gen2 Type-A
18	HDMI Port
19	DisplayPort
20	RJ-45 for 2.5 Gigabit Ethernet (LAN2)
21	RJ-45 for 2.5 Gigabit Ethernet (LAN1)

The system has a 12-19VDC input with 10% tolerance.

The Arena-Pine features two USB 3.2 Gen2 Type-A ports that support transfer speeds of up to 10Gbps. Additionally, there are two USB 3.2 Gen2 Type-C ports with the same transfer speed capability. The dual Type-C ports also support DP 1.4 via DP Alt Mode and Thunderbolt 4, allowing for display output with a maximum resolution of 4096×2160 at 60Hz.

The HDMI 2.0a port on the board supports a maximum output resolution of 4096×2160 at 60Hz. Similarly, the DisplayPort 1.4 port can handle a maximum output resolution of 4096×2160 at 60Hz.

For networking, the Arena-Pine includes dual on-board RJ-45 2.5 gigabit Ethernet ports, which are controlled by an Intel I226LM gigabit controller. For more detailed information about the controller, please refer to the documentation on the RJ-45 Connector for Networking Interface (LAN1/LAN2).

2.3   Mechanical Dimensions

2.3.1   PCB Chassis Mount

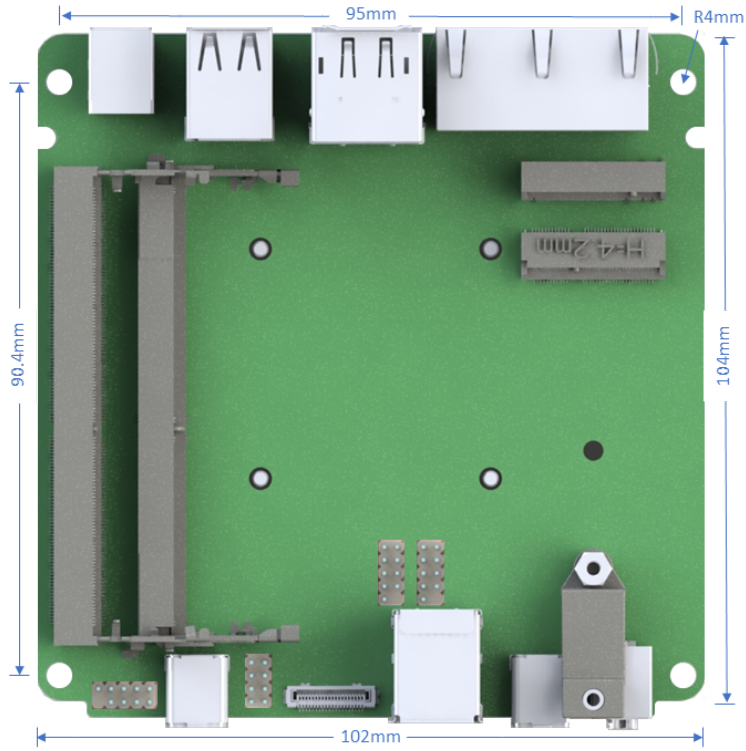The dimensions for the PCB to securely mount into a chassis are given in Figure 9.

Figure 9: Motherboard Dimensions

2.3.2   System Height

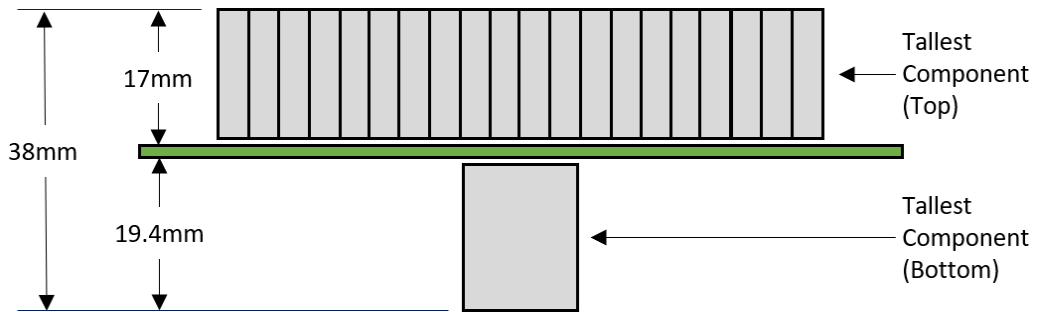The maximum height of a populated system is shown below.

Figure 10: System Height

2.3.3　　　Chassis Dimensions

2.3.4　System Weight

The weight of the device with the chassis, 2 sticks of RAM, and an SSD is 1.5Kg.

1　　　Environmental Specifications

Table 9: Environmental Specifications

Condition	Specification
Input Voltage	12V – 19V ±10%
Input Voltage Connector	5.5×2.5mm Barrel Plug
Recommended PSU Wattage	90W
Operating Temperature	0°C– 60°C
Operating Humidity	5% – 90%
Storage Temperature	-40°C – 85°C

Condition	Specification
Storage Humidity	5% – 90%

2   Version History

Version	Date	Comments
0.1	03/13/2023	Initial Creation