



# TPS / Technical Product Specification

---

## **Zircon 4 x 4 System**

CPU Model / SKU

N95 / NUC12ZRN

Version Date: 11/02/23

Version: 1.1

## Preface

Following is a technical overview of the Zircom 4 x 4 NUC system and its features. You can index into the various sections of the document by clicking on the line item of interest within the table of contents below.

## Contents

|                                                        |    |
|--------------------------------------------------------|----|
| Tables                                                 | 4  |
| Figures                                                | 5  |
| 1. Description / Overview                              | 6  |
| 1.1. Processor                                         | 6  |
| Table 1: CPU Features                                  | 6  |
| 1.2. Integrated Graphics Processing Unit               | 7  |
| Table 2: Integrated Graphics                           | 7  |
| 1.3. Memory / Storage                                  | 7  |
| Single JEDEC DDR4 SO-DIMM Socket                       | 7  |
| 1.4. SATA Interface                                    | 8  |
| 1.5. PCIe Interface                                    | 8  |
| 1.6. Networking                                        | 8  |
| 1.7. Wireless Networking Interface                     | 8  |
| 2. Technical References                                | 9  |
| 2.1. CPU Fan Header                                    | 9  |
| Figure 1: CPU Fan Header                               | 9  |
| Table 3: CPU Fan Header Pinout                         | 9  |
| 2.2. M.2 For Storage / nVME & SATA                     | 10 |
| Table 4: M.2 Key-M SSD Pinout                          | 10 |
| 2.3. M.2 for Radio                                     | 12 |
| Table 5: M.2 Key-E Pinout                              | 12 |
| 2.4. SATA Header                                       | 14 |
| An optional 2.5" SSD expansion bay drive is supported. | 14 |
| Figure 2: SATA Header                                  | 14 |
| Table 6: SATA Header Pinout                            | 14 |
| 2.5. Battery Header                                    | 15 |
| Figure 3: Battery Header                               | 15 |
| Table 7: Top Side Battery Header Pinout                | 15 |
| 2.6. System / Motherboard- PCB                         | 15 |
| Figure 4: Top & Bottom Views Of Motherboard            | 15 |
| 2.7. Front & Back I/O Connectors                       | 16 |
| Figure 5: Front Side I/O Connections                   | 16 |

|                                                   |           |
|---------------------------------------------------|-----------|
| Figure 6: Back Side I/O Connections               | 16        |
| Table 9: Back Side I/O Connections...             | 16        |
| Figure 10: Side I/O Connection & Security Feature | 17        |
| 3. PCB Mechanical Dimensions                      | 18        |
| 3.1. PCB & Mechanical (Motherboard Height)        | 18        |
| Figure 8: Motherboard Front Height                | 18        |
| Figure 9: Motherboard Rear Height                 | 18        |
| <b>5. AC Power Brick</b>                          | <b>19</b> |
| 6. Version History                                | 19        |

## Tables

|                                                             |    |
|-------------------------------------------------------------|----|
| Table 1: CPU Features                                       | 6  |
| Table 2: Integrated Graphics                                | 6  |
| Table 3: <b>CPU Fan Header Pinout</b>                       | 8  |
| Table 4: <b>M.2 Key-M SSD Pinout</b>                        | 8  |
| Table 5: <b>M.2 Key-E Pinout</b>                            | 9  |
| Table 6: <b>SATA Header Pinout</b>                          | 9  |
| Table 7: <b>Top Side Battery Header Pinout</b>              | 10 |
| Table 8: Front Side I/O Connector                           | 11 |
| Table 9: Back Side I/O Connector                            | 13 |
| Table 10: <b>Side I/O Connection &amp; Security Feature</b> | 14 |
| Table 11: Side I/O Connectors & Security Feature...         | 15 |

## Figures

|                                                             |    |
|-------------------------------------------------------------|----|
| Figure 1: CPU Fan Headers                                   | 8  |
| Figure 2: <b>SATA Header</b>                                | 8  |
| Figure 3: <b>Battery Header</b>                             | 9  |
| Figure 4: <b>Top &amp; Bottom Views Of Motherboard</b>      | 9  |
| Figure 5: <b>Front Side I/O Connections</b>                 | 13 |
| Figure 6: <b>SATA Header Pinout</b>                         | 14 |
| Figure 7: <b>Side I/O Connection &amp; Security Feature</b> | 15 |
| Figure 8: <b>Motherboard Front Height</b>                   | 15 |
| Figure 9: Motherboard Rear Height                           | 15 |

# 1. Description / Overview

The Zircon system is a small form factor PC which can serve a number of end user needs. Ranging from general computing, WEB access and multi display, (up to 3 4K) usage models. It consists of a fanless integration of the Intel N95 processor, fixed memory configuration, (16 Gig / DDR4 3200 speed). It also has an RJ-45 connector for wired network access and USB Type A and Type C ports.

## 1.1. Processor

**Table 1: CPU Features**

|                          |                                     |
|--------------------------|-------------------------------------|
| Intel                    | Intel® Processor N95 / Alder Lake N |
| P/N                      | N95                                 |
| Max Turbo Frequency      | 3.40Ghz                             |
| CPY TDP                  | 15 Watts                            |
| T junction               | 105 Degrees C                       |
| Cores                    | 4                                   |
| Threads / Hyperthreading | 4 / N/A                             |
| Performance Cores        | N/A                                 |
| Efficiency Cores         | 8                                   |
| L1 Cache                 | 4 x 64MB                            |
| L2 Cache                 | 4 x 2 MB                            |
| L3 Cache                 | 6 MB                                |
| Integrated Graphics      | Intel UHD Graphics                  |

## 1.2. Integrated Graphics Processing Unit

**Table 2: Integrated Graphics**

| Intel Integrated                             | Intel UHD Graphics                                                                                                                                                   |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Graphics Max Dynamic Frequency               | 1.2Ghz                                                                                                                                                               |
| Graphics Output                              | <ul style="list-style-type: none"> <li>- DisplayPort 1.4</li> <li>- Embedded DisplayPort 1.4b</li> <li>- HDMI 2.1</li> <li>- MIPI-DSI 1.3</li> </ul>                 |
| Max Resolution (HDMI)                        | 4096 x 2160@60Hz                                                                                                                                                     |
| Max Resolution (DP)                          | 4096 x 2160@60Hz                                                                                                                                                     |
| Max Resolution (eDP - Integrated Flat Panel) | N/A                                                                                                                                                                  |
| DirectX* Support                             | Ver. # 12.1                                                                                                                                                          |
| OpenGL* Support                              | Ver. # 4.6                                                                                                                                                           |
| OpenCL*                                      | Ver. # 3.0                                                                                                                                                           |
| Intel® Quick Sync Video                      | Yes                                                                                                                                                                  |
| Displays Configurations Supported            | <ul style="list-style-type: none"> <li>- (3) 1080P 60Hz</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>- (2) 4K @ 60Hz</li> <li>- (1) @ 30Hz</li> </ul> |

## 1.3. Memory / Storage

### Single JEDEC DDR4 SO-DIMM Socket

- Qty. 1 SO-DIMM / DDR4 @ 3200 / Single Channel
- Configuration Available:
  - 4GB
  - 8GB
  - 16GB
  - 32GB

## 1.4. SATA Interface

- Ver. #3 / 6.0 Gb/s

## 1.5. PCIe Interface

- N/A

## 1.6. Networking

- 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.

## 1.7. Wireless Networking Interface

- M.2 / 2242 Slot
- Intel Wireless Card / AC7265
- Dual Band / 2.4GHz & 5.0GHz
- Wi-Fi Version 5.0 / 802.11ac
- Antenna Structure 2 x 2
- Integrated Bluetooth Version 4.2

## 2. Technical References

### 2.1. CPU Fan Header

Figure 1: CPU Fan Header

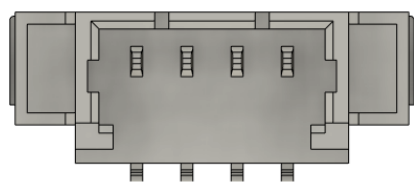


Table 3: CPU Fan Header Pinout

| Pin | Designation |
|-----|-------------|
| 1   | Power (Red) |
| 2   | PWM Control |
| 3   | GND (Black) |
| 4   | PWM Control |

## 2.2. M.2 For Storage / nVME & SATA

**Table 4: 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  |
| 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   |

## 2.3. M.2 for Radio

**Table 5: 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  |

| Pin | Signal | Signal | Pin |
|-----|--------|--------|-----|
| 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   |

## 2.4. SATA Header

An optional 2.5" SSD expansion bay drive is supported. There is a drive cable mounted to the motherboard which carries the noted pinout listed below.

Figure 2: SATA Header

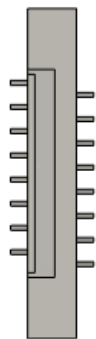


Table 6: SATA Header Pinout

| Pin | Signal       | Signal    | Pin |
|-----|--------------|-----------|-----|
| 1   | 5V           | Ground    | 9   |
| 2   | 5V           | Ground    | 10  |
| 3   | 5V           | SATA_RX0P | 11  |
| 4   |              | SATA_RX0N | 12  |
| 5   |              | Ground    | 13  |
| 6   |              | SATA_TX0P | 14  |
| 7   |              | SATA_TX0N | 15  |
| 8   | SATA_DEVSLP0 | Ground    | 16  |

Note: The optional 2.5" SSD drive mounts on the underside of the top cover...

## 2.5. Battery Header

Figure 3: Battery Header

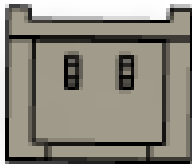


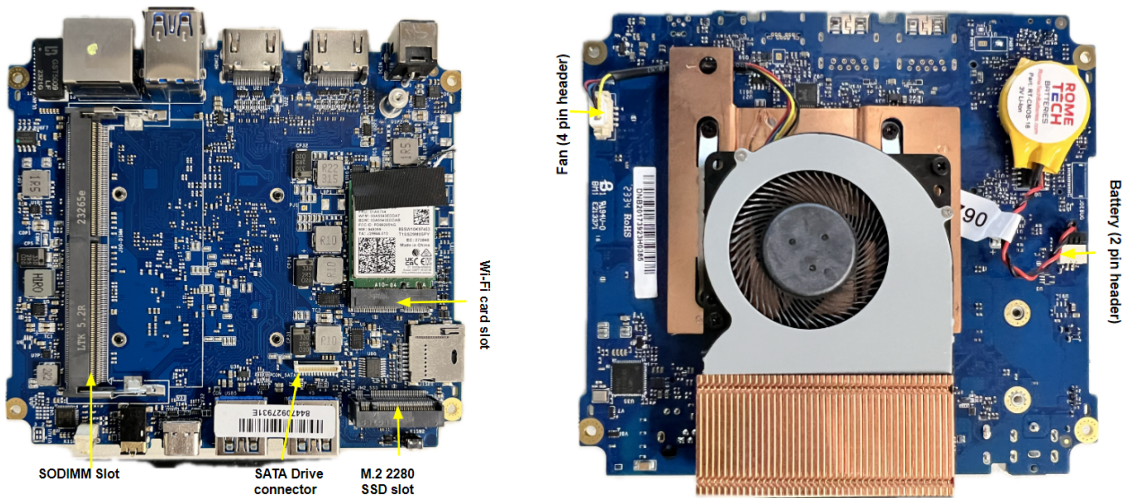
Table 7: Top Side Battery Header Pinout

| Pin | Signal                  | Notes               |
|-----|-------------------------|---------------------|
| 1   | 3V Positive (+) / Right | CR-2032 / Coin Cell |
| 2   | Ground (-) / Left       |                     |

Note: Key is oriented at the top in the image above...

## 2.6. System / Motherboard- PCB

Figure 4: Top & Bottom Views Of Motherboard



2.7. Front & Back I/O Connectors

Figure 5: Front Side I/O Connections

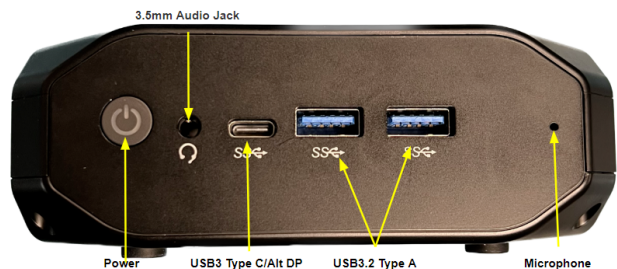


Table 8:: Front Side I/O Connectors...

| Feature / Connector | Description                     |
|---------------------|---------------------------------|
| Power Button        | Main Power On / Off Button      |
| Stereo Audio        | 3.5mm Headphone Jack            |
| USB Type C          | Port #1 / Version: 3.0          |
| USB Type A          | Port #1 / Version: 3.0 - Gen. 2 |
| USB Type A          | Port #2 / Version: 3.0 - Gen. @ |
| DMIC                | Single Port Digital Microphone  |

Figure 6: Back Side I/O Connections

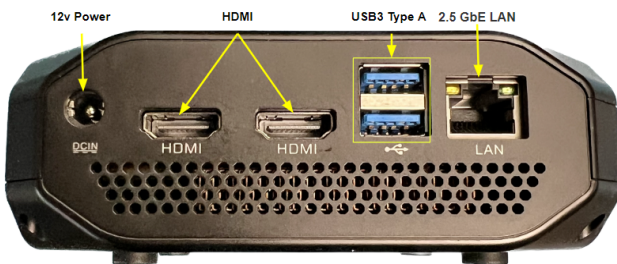


Table 9: Back Side I/O Connections...

| Feature / Connector     | Description               |
|-------------------------|---------------------------|
| Power Input Jack        | 12VDc / 3.0A / 24 Watts   |
| HDMI Output             | Port #1 / Version: 2.0    |
| HDMI Output             | Port #2 / Version: 2.0    |
| USB Type A (Dual Stack) | Version: 3.0 - Gen. 2     |
| RJ-45 Input Jack        | Single Network Connection |

Figure 10: Side I/O Connection & Security Feature



Table 11: Side I/O Connectors & Security Feature...

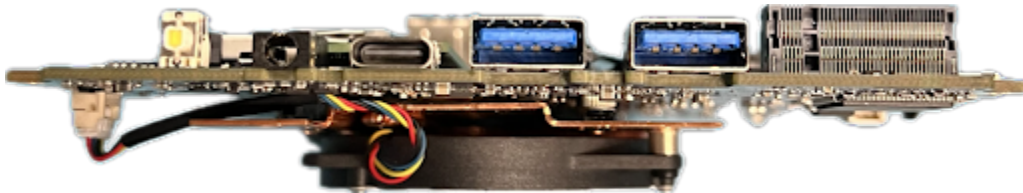
| Feature               | Description                       |
|-----------------------|-----------------------------------|
| Micro-SD Card Slot    | Supports Up To 32GB               |
| Kensington Lock Mount | Supports Lockable Cable Mechanism |

### 3. PCB Mechanical Dimensions

- Width (Side To Side): 114mm / 4.49"
- Length (Front To Back): 104mm / 4.09"

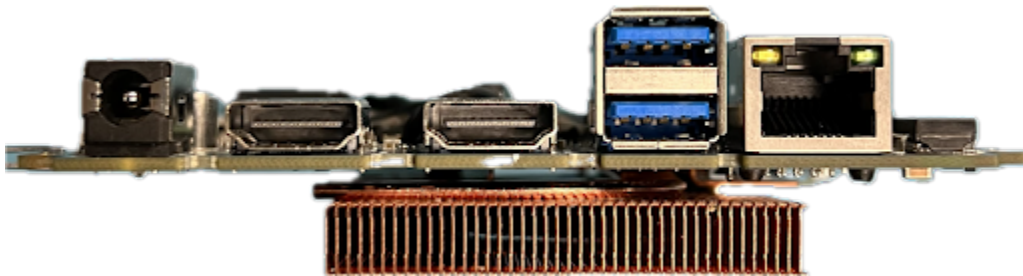
#### 3.1. PCB & Mechanical (Motherboard Height)

**Figure 8: Motherboard Front Height**



Height Max: 25 mm

**Figure 9: Motherboard Rear Height**



Height Max: 30 mm

### 4. System / Chassis Dimensions

- Width (Side To Side): 124mm / 4.88"
- Length (Front To Back): 104mm / 4.09"

## 5. AC Power Brick

- 100 - 240 VAc / 50-50 Hz
- 5.5mm Barrel Jack
- Two Pin (Power / Ground)
- Two Prong AC Outlet Connection

## 6. Version History

| Version | Date     | Comments                                                       |
|---------|----------|----------------------------------------------------------------|
| 0.9     | 10/27/23 | Initial draft for Solutions Engineering Development & Review.. |
| 1.0     | 11/01/23 | Release Version...                                             |
| 1.1     | 11/02/23 | Minor Corrections to Terminology...                            |