# Radxa SiRider S1 Product Brief

## High-Reliability Single Board Computer

### Revision 1.0

Radxa Computer

# Contents

# 1 Revision Control Table

| Version | Date | Changes from previous version |
|---------|------|-------------------------------|
| 1.0 | 2024/11/22 | First version |

## 2 Introduction

The Radxa SiRider S1 is a high-performance Single Board Computer powered by the Siengine SE1000 SoC. It's engineered for applications requiring robust computing and strong security. The SiRider S1 excels in providing stable, efficient solutions, designed to meet the rigorous demands of complex environments.



*Note:* The actual board layout or components location may change during the time but the main connectors type and location will remain the same

## 3 Features

### 3.1 Hardware

- Siengine SE1000 SoC
- CPU

- **–** Cluster0: Quad ARM Cortex®-A76 up to 2.4GHz and Dual ARM Cortex®-A55 up to 1.8GHz
  - **–** Cluster1: Dual ARM Cortex®-A55 up to 1.8GHz
- Dual HiFi5 DSPs for Audio Processing, Voice Enhanment and AI-based Speed Recognition
- Dual NPUs, one supporting up to 3.34 TOPs and the other up to 3.5 TOPs
- GPU subsystem comprises three components: ARM G76 MP10 3D GPU, ARM G76 MP4 3D GPU and 2D/2.5D GPU.

  - **–** Supporting OpenGL ES 1.1/2.0/3.2
  - **–** Supporting Vulkan 1.0
  - **–** Supporting OpenCL 2.0

- Safety Processor Single ARM Cortex-R52 up to 1.0GHz with DCLS meeting ISO 26262 ASIL-D safety level requirements
- LPDDR5 RAM up to 16GB
- Onboard UFS 3.0
- Dual ISP each up to 800 Mpixel/s, total up to 1600Mpixel/s
- Multimedia decoder up to 4K@120fps
- Decoding Formats: H.264, H.265, VP9, AVS2 etc
- Multimedia encoder up to 4K@60fps
- Encoding Formats: H.264, H.265, JPEG

## 3.2 Interface

- 2x Gigabit Ethernet Ports
- 4x USB 3.0 HOST Type-A Ports
- 4x USB 2.0 HOST via 4-Pin 1.25mm Pitch Connector
- 1x USB 2.0 OTG / HOST Type-C Port for Debug and Data
- 1x Headphone Jack with Microphone Input
- 1x M.2 E Key Connector for WiFi 6
- 1x SIM Card Slot
- 1x M.2 B Key Connector for 4G / 5G Mobile Network
- 1x M.2 M Key Connector with PCIe 3.0 2-lane for NVMe SSD
- 1x HDMI TX
- 1x 4-lane MIPI DSI for MIPI LCD
- 2x 2-lane MIPI CSI for Camera
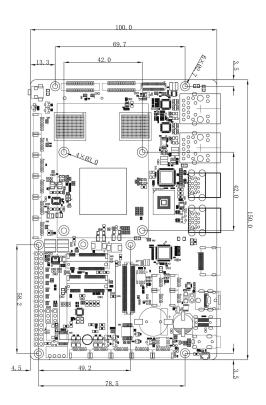- 1x microSD Card Slot

- 1x RTC Socket
- 1x Fan Header with PWM control via 2-Pin 1.25 pitch connector
- 11x 6-Pin 1.25 Pitch Connector have the following features:

    - 2x I2C
    - 2x I2S
    - 2x UART
    - 1x RS232/RS485
    - 1x CAN
    - 2x DIO In
    - 1x DIO Out

- 40-Pin 2.54mm Pitch header supporting a wide range of interface options:
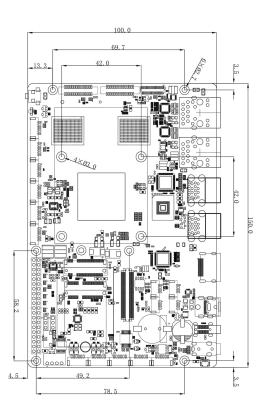
    - UART
    - I2C
    - SPI
    - GPIO

## 3.3 Software

- ARMV8 Instruction Set
- Debian Linux support
- Android support
- Hardware access/control library for Linux/Android

# 4 Mechanical Specification



# 5 Electrical Specification

## 5.1 Power Requirements

The Radxa SiRider S1 supports various power supply technologies including smart power adapter as well as fixed voltage:

- USB Type-C PD Version 2.0 with 9V, 12V, 15V and 20V input support
- Power adapter with fixed voltage in 5V to 20V range on the USB Type-C port
- 5V Power applied to the GPIO PIN 2 & 4

The recommended power source should be able to produce, at least, 12W without power consuming devices on USB 3 or 20W with full USB ports and PCIe 3.0 load.

## 5.2  GPIO Voltage

| GPIO | Voltage Level | Tolerance |
|---|---|---|
| All GPIO | 3.3V | 3.63V |
| SARADC_IN5 | 3.3V | 3.3V |

# 6  Operating Conditions

To ensure optimal performance and prevent overheating in high-temperature environments, the use of appropriate heat dissipation devices, such as heatsinks or cooling fans, is required.  This ensures stable operation even under heavy workloads or in extreme conditions.  Proper thermal management is crucial for maintaining the longevity and reliability of the system in applications.

# 7  Peripherals

## 7.1  GPIO Interface

The SiRider S1 offers a 40 pin GPIO expansion header which provides extensive compatibility with a wide range of accessories developed for the SBC market.

### 7.1.1  GPIO Alternate Functions

| Pin# | Function1 | Function2 | Function3 | Function4 | Function5 |
|---|---|---|---|---|---|
| 1 | +3.3V | +3.3V | | | |
| 2 | +5.0V | +5.0V | | | |
| 3 | | PERI1_GPIO2 | PERI1_UART_5_TX | PERI1_I2C_7_SDA | |
| 4 | +5.0V | +5.0V | | | |
| 5 | | PERI1_GPIO3 | PERI1_UART_5_RX | PERI1_I2C_7_SCL | |
| 6 | GND | GND | | | |
| 7 | | SAF_UART_2_TX | PERI1_GPIO1 | PERI2_SPI_MST_1_SCLK | PERI2_SPI_SLV_1_SCLK |
| 8 | | PERI1_GPIO3 | PERI1_UART_11_CTS | PERI1_UART_12_TX | PERI1_I2C_14_SDA |
| 9 | GND | GND | | | |
| 10 | | PERI1_GPIO3 | PERI1_UART_11_RTS | PERI1_UART_12_RX | PERI1_I2C_14_SCL |
| 11 | SAF_UART_2_RX | PERI2_GPIO1 | PERI2_SPI_MST_1_SS0 | PERI2_SPI_SLV_1_SS | |
| 12 | SAF_SPI_MST_1_SS0 | PERI2_GPIO0 | PERI2_SPI_SLV_0_SS | | |

| Pin# | Function1 | Function2 | Function3 | Function4 | Function5 |
|------|-----------|-----------|-----------|-----------|-----------|
| 13 | SAF_GPIO1 | PERI1_GPIO4 | | | |
| 14 | GND | GND | | | |
| 15 | SAF_QSPI_SS1 | PERI2_GPIO1 | | | |
| 16 | | PERI0_GPIO1 | I2S2_SCK | | |
| 17 | +3.3V | +3.3V | | | |
| 18 | | PERI0_GPIO1 | I2S2_WS | | |
| 19 | SAF_SPI_MST_0_MOSI | PERI2_GPIO0 | SAF_I2C_4_SCL | | |
| 20 | GND | GND | | | |
| 21 | SAF_SPI_MST_0_MISO | PERI2_GPIO0 | | | |
| 22 | | PERI0_GPIO1 | I2S_DO | | |
| 23 | SAF_SPI_MST_0_SCLK | PERI2_GPIO0 | | | |
| 24 | SAF_SPI_MST_0_SS0 | PERI2_GPIO0 | | | |
| 25 | GND | GND | | | |
| 26 | SAF_SPI_MST_0_SS1 | PERI2_GPIO0 | GP_CLK0 | SAF_PWM_0 | |
| 27 | | PERI1_GPIO3 | PERI1_UART_5_CTS | PERI1_UART_6_TX | PERI1_I2C_8_SDA |
| 28 | | PERI1_GPIO3 | PERI1_UART_5_RTS | PERI1_UART_6_RX | PERI1_I2C_8_SCL |
| 29 | SAF_GPIO2 | | | | |
| 30 | GND | GND | | | |
| 31 | SoC_Fault0 | | | | |
| 32 | SAF_GPIO5 | | PERI2_UART_1_CTS | PERI2_I2C_1_SDA | |
| 33 | SAF_GPIO6 | | PERI2_UART_1_RTS | | |
| 34 | GND | GND | | | |
| 35 | SAF_SPI_MST_1_MISO | PERI2_GPIO0 | SAF_I2C_5_SDA | | |
| 36 | | PERI0_GPIO1 | I2S2_DI | | |
| 37 | SoC_Fault1 | | | | |
| 38 | SAF_SPI_MST_1_MOSI | PERI2_GPIO0 | SAF_I2C_5_SCL | PERI2_SPI_SLV_0_MISO | |
| 39 | GND | GND | | | |
| 40 | SAF_SPI_MST_1_SCLK | PERI2_GPIO0 | PERI2_SPI_SLV_0_SCLK | | |

*Note:* Function 1 is a feature enabled in Safety Mission Mode(safety_enable = 1).

## 7.2  Network

The SiRider S1 offers two 10/100/1000Mbps RJ45 connector for wired networking.

## 7.3  USB

The SiRider S1 provides the following USB ports: Four USB 3.0 HOST Type-A ports with high data transfer rates (up to 5 Gbps) for connections with high data transfer requirements, four USB 2.0 HOST with via a 4-pin, 1.25mm pitch connector used to meet the needs of those who require a compact design and one USB 2.0 OTG / HOST Type-A Port for Debug.

## 7.4  M.2 M Key Connector

The SiRider S1 presents an M.2 M Key 2280 SSD socket with PCIe 3.0 x 2-lane interfaces, delivering swift and efficient storage access, synonymous with high-speed performance.

## 7.5  M.2 E Key Connector

The SiRider S1 boasts an M.2 E Key socket, offering a versatile array of interfaces including PCIe 3.0 x 1-lane and USB. This configuration greatly facilitates high-speed WiFi and Bluetooth connectivity, including support for the latest WiFi 6 standards.

## 7.6  M.2 B Key Connector

The SiRider S1 offers a USB interface through its M.2 B Key socket. When combined with a SIM card (the SE1000 features a SIM slot), it enables high-speed 4G / 5B mobile phone connectivity and guarantees compatibility with standard M.2 3042 B Key modules.

## 7.7  Video Input

The SiRider S1 has two 2-lane MIPI CSI Connector for Camera. These connectors are designed for Radxa Camera accessories and also backwards compatible with standard industrial camera peripherals with adapter FPC cables by Radxa.

## 7.8  Video Output

The SiRider S1 has two Standard HDMI output ports and one 4-lane MIPI DSI Connector for MIPI LCD. The MIPI DSI Interface are designed for Radxa Display accessories and also backwards compatible with standard industrial display peripherals with adapter FPC cables by Radxa.

## 7.9  Audio Jack

The SiRider S1 supports high quality analogue audio output via a 4-ring 3.5mm headphone jack. The analog audio output can drive 32 Ohm headphones directly. The audio jack also supports microphone input as default.

## 7.10 Fan Connector

The SiRider S1 has a 2pin 1.25mm header that enables users to connect a 5V fan (or other peripheral). The fan can be PWM controlled without speed feedback.

# 8 Support

For support please see the hardware documentation section of the Radxa Website and post questions to the Radxa forum.