BEDROCK R8000

Unmatched Fanless Performance

- 1st fanless industrial PC with AMD Ryzen 7840HS Zen4 "Phoenix"

- High performance Radeon 780M RDNA3 GPU with four displays

- State of the art thermal design for operation in -40°C to 85°C

- Easy-to-integrate compact design with DIN-Rail mounting, 12V-60V DC input

Power & Efficiency in Perfect Balance

SolidRun Bedrock R7000 Basic is powered by AMD RyzenTM 7 7840HS / 7840U processor with 8 Zen 4 cores and 16 threads running at up to 5.1 GHz. The APU has an integrated AMD RadeonTM 780M GPU with 12 CUs running at 2700 MHz.

The chip is fabricated using TSMC state-of-the-art 4nm FinFET process, and is the most power efficient high-performance x86 CPU on the market for compute and graphics workloads.

Packed Solid with Features

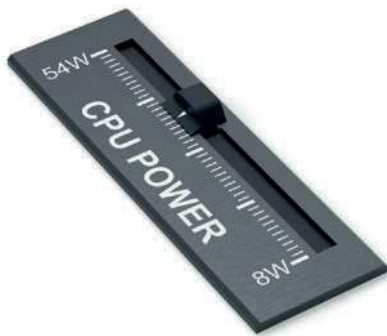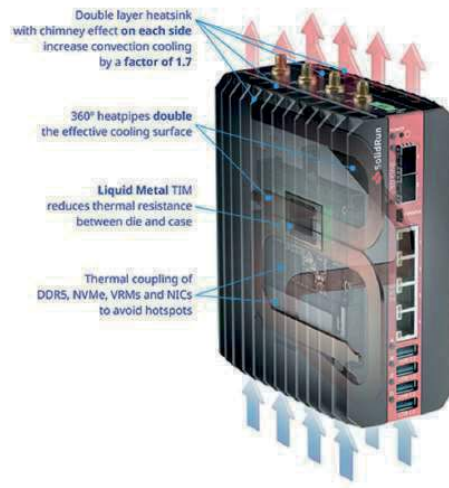| 4K Displays	NVME Gen 4x4	2.5 Gbit Ethernet
64 GB DDR5 ECC	WiFi 6E BT 5.3	5G Modem Dual SIM

The I/O, storage and networking devices found in SolidRun's Bedrock R7000 Basic stand out in both performance and capacity. 4 display outputs HDMI 2.1 / DP 2.1 each 8K capable or 4x4K are driven by the powerful Radeon 780M GPU. 64 GB DDR5 with ECC, 3x NVME Gen4 2280, 2x 2.5 GbE ports, WiFi 6E, 5G modem with dual SIM and 4 USB ports. All these features are tightly packed in a fanless enclosure of under 1 liter.

Remarkable Fanless Cooling

Hot chips require innovative cooling. Bedrock was designed from the ground up for effective fanless cooling. The CPU is thermally coupled to the chassis using liquid metal TIM to reduce thermal resistance. Stacked heatpipes distribute the heat evenly 360° around the all-aluminum chassis. To optimize convective heat transfer, each chassis wall has two heat exchange layers – aluminum air-ducts that stimulate airflow by chimney effect, and another layer of conventional cooling ribs. As a result, Bedrock can dissipate over 3 times the power of fanless computers of similar size.

Double layer heatsink with chimney effect **on each side** increase convection cooling by a **factor of 1.7**

360° heatpipes **double** the effective cooling surface

Liquid Metal TIM reduces thermal resistance between die and case

Thermal coupling of DDR5, NVMe, VRMs and NICs to avoid hotspots

Full Control of CPU Power

With Bedrock R7000 you don't have to guess how much power the system draws. Instead you can precisely set CPU power limit across an exceptionally broad power range of 8W to 54W. This is particularly useful in scenarios where limited power has to be shared between the IPC and additional devices, and when integration constraints prevent ideal heat dissipation.

Rock Solid Reliability

Bedrock is designed with reliability in mind based on decades of experience in development of IPCs and embedded systems. DC power is through a terminal block with screw locking and has a wide voltage range of 12V – 60V with two stages of regulation. RAM supports ECC. NVMe with power-loss-protection (PLP) can be ordered. Bedrock has redundant SPI Flash to prevent bricking by BIOS corruption as well as WDT and TPM. The enclosure is extremely ruggedized – all-aluminum, fanless and ventless dust-resistant IP40.

Innovative Modular Design

Bedrock is designed to address the diversity of requirements in the IoT space. This is achieved by partitioning the hardware into the following boards:

SoM with the CPU, DDR5 and NVMe slots and all native interfaces on 380 pins of high density connectors.
Networking and I/O board (NIO) with NICs and ports.
Storage and Extension Cards board (SX) with slots for WiFi, 5G modem and extra NVMe devices.
Power Module (PM) with DC to DC converter and DC input connector.
This modular design enables agile customization of Bedrock for addressing specific requirements. SolidRun is developing multiple NIO, SX and PM boards that can be mixed and matched as an off-the-shelf solution and also offers development of custom boards as an ODM service. Customers and 3rd parties that are interested in developing custom NIO, SX or PM boards are welcome to contact SolidRun for support.

Bedrock enclosure is designed with customization in mind. Modification of I/O, power input, antenna openings etc. can be performed cost effectively even in small volume.
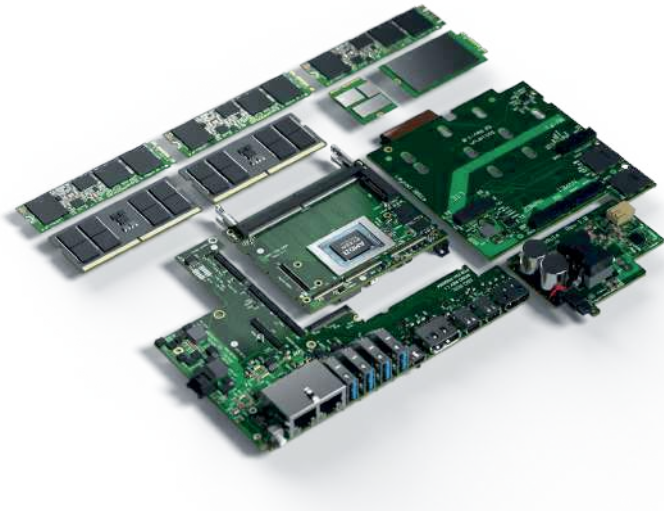
Painless Integration

The compact footprint of Bedrock, robust structure, effective fanless cooling and DC input tolerance simplify Bedrock integration. All Bedrock I/O is brought to the front panel, with DC input and antennas in the top panel. The bottom and rear panel are both reserved for mounting, allowing full usability while Bedrock is mounted to a wall or to a desk.
SolidRun offers multiple types of mounting brackets, including lever-based DIN-Rail bracket with locking, wall mount, small stand and ruggedized stand.

Field Usability

As a fanless, ventless IPC Bedrock requires no maintenance. Bedrock is designed to avoid the need to open it in the field. SIM cards are accessible from the panel using pin-hole trays. Remote power button connector is conveniently located on the top panel. All brackets and mounting fixtures are assembled from the outside. Should the need arise to open Bedrock (e.g. to install a storage device or replace the RTC battery) Bedrock opens by unscrewing a single screw.

The 0.6 liter Bedrock Tile

When integrating an IPC in tight space convection cooling becomes ineffective and is better replaced with conduction cooling. It is also desirable to make the IPC as compact and thin as possible.

Bedrock Tile is designed for these use cases. The ribbed chassis walls are replaced with flat walls with blind threadings for fastening Bedrock Tile to a cold plate. A key feature of Bedrock Tile is that it preserves the 360° internal heat distribution so it can be cooled from either side. With thickness of just 29mm and volume of 0.6 liter, Bedrock Tile is easy to integrate in tight spaces. Having all connectors on one side further simplifies the integration.
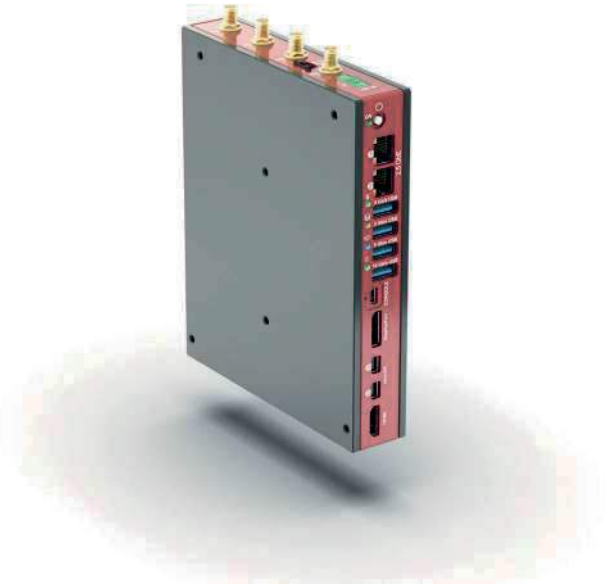
Advanced Integration Using Deck

Some integration scenarios call for custom enclosures (e.g. when additional devices must be installed with the computer in the same housing). To support these use cases Bedrock introduces the Deck concept (deck-of-cards). The SoM, NIO, SX and PM are rigidly held together with fasteners independently of the Bedrock enclosure. The Deck provides first stage cooling for most devices, in particular it includes a copper heat-plate on the CPU. The Deck is fastened to the custom chassis with only 3 screws. Fastening provides thermal coupling to the CPU, RAM, NVMe and FETs. The DC input connector is on wires and can be relocated in the chassis.

Designing with Bedrock SoM

Bedrock SoM makes a convenient and flexible building block for board designers. For many developers, using Bedrock R7000 SoM would be the best way to develop a custom appliance based on the popular AMD RyzenTM 7040 series. Bedrock SoM makes an attractive platform for that purpose for several reasons.

The SoM is far more self-contained than traditional SoMs. It has not only the essential CPU and RAM, but also NVMe, direct DC input with 12V – 19V tolerance and RTC battery. The SoM is provided in a ruggedized metal skirt that protects the SoM, provides mounting fixture for extension cards and serves as a heat-spreader for secondary heat sources. Copper heat-plate is pre-assembled on the CPU.

Block Diagram

(optional)

PM 1260
Power Module

Phoenix terminal block

12V - 60V DC

DC-DC converter

19V DC

SoM R8000
System on Module

2x SODIMM DDR5

DDR5-5600 (Quad channel ECC)

NVMe Gen 4 M.2 key-M 2280

4x PCIe Gen 4

2x SPI FLASH 256 Mbit

SPI

TPM 2.0

SPI

AMD Ryzen™ Embedded 8000 Processor

RTC

BR2032 RTC battery

19V DC

PCIe Gen 4 9 ports 16 lanes

4x DDI

2x USB 4.0 40 Gb/s

2x USB 3.2 10 Gb/s

4x USB 2.0

3x UART

2x I2C

ESPI

GPIOs

NIO R8000 Basic
Networking & I/O

2x Intel I226 2.5 Gbps Ethernet controller

USB 3.2 5 Gb/s hub CYUSB3304

UART to USB converter

HDMI 2.1

HDMI

DP 2.1

2x mini-DP

DP 2.1

DisplayPort

2x 2.5 Gbps Ethernet

2x RJ45

USB 3.2 10 Gb/s

USB 3.2

3x USB 3.2 5 Gb/s

3x USB 3.2

USB 2.0

mini-USB (console)

Remote Power Button With LED

SX 4M2
Storage & Extension cards

19V DC

(optional)

M.2 key-M

NVMe Gen 4 M.2 key-M 2280 or Hailo-8™ AI Acceleration Module

PCIe Gen 4 4 lanes

M.2 key-M

NVMe Gen 4 M.2 key-M 2280 or Hailo-8™ AI Acceleration Module

PCIe Gen 4 4 lanes

M.2 key-E

WiFi 6E + BT 5.3 M.2 key-E 2230 or Hailo-8™ AI Acceleration Module

PCIe Gen 4

USB 2.0

M.2 key-B

4G / 5G modem M.2 key-B 3042 / 3052

USB 3.2 5 Gb/s

2x nano-SIM (accessible trays)

Specifications

Feature	Specification	Notes
CPU	AMD Ryzen™ Embedded 8000 8C/16T Zen4 4nm Up to 5.1 GHz Up to 54W	
GPU	AMD Radeon™ 780M	Up to 12 CU @ 2700 MHz
NPU	AMD Ryzen™ AI 16 TOPS	
AI Acceleration	Up to 3x Hailo-8 M.2 AI Inferencing Acceleration Module 26 TOPS Up to 2x Hailo-10 M.2 Generative AI Acceleration Module 40 TOPS	2x M.2 key-M 2242 (each precludes an NVME) 1x M.2 key-E 2230 (precludes WiFi)
TPM	fTPM 2.0 (in Ryzen) + dTPM 2.0 (Infineon)	Select in BIOS
Display	1x HDMI 2.1 1x Display Port 2.1 2x mini-DisplayPort 2.1	Max resolution / refresh rate: 7680x4320 @ 60Hz 3840x2160 @ 240Hz
Storage	Up to 3x NVMe PCIe Gen4 x 4	M.2 key-M 2280 Optional power-loss-protection NVMe is conduction cooled Each 2nd/3rd NVMe precludes one Hailo-8 key-M
LAN	Up to 4x 2.5 GbE (Intel I226)	4x RJ45 (NIO R8000 4X25) | 2x RJ45 (NIO R7000 Basic)
WLAN	WiFi 6E (Intel AX210) BT 5.3	2x RP-SMA antennas Optional and upgradable (M.2 key-E 2230)
Modem	4G / 5G (Quectel)	2x SMA antennas Optional and upgradable (M.2 key-B 3042 / 3052)
USB	Up to 1x USB 4.0 40 Gb/s 1x USB 3.2 gen 2 10 Gb/s 3x USB 3.2 gen 2 5 Gb/s	Connectors: USB-C / USB-A
Console	Serial over USB	mini-USB connector
BIOS	AMI Aptio V	Dual SPI FLASH for redundancy Console redirection
Operating systems	Windows 10/11/IoT, Linux	Other x86 operating systems supported
Power	DC 12V-60V	Phoenix terminal Other DC connectors available
Temperature range	Up to -40°C to 85°C	Also available in commercial temperature range
Enclosure	All aluminum enclosure, fanless cooling	
Dimensions	30W model: 45 mm (W) x 160 mm (H) x 130 mm (D) - 0.9 liter 60W model: 73 mm (W) x 160 mm (H) x 130 mm (D) - 1.5 liter Tile model: 29 mm (W) x 160 mm (H) x 130 mm (D) - 0.6 liter	
Mounting	DIN-rail, wall, VESA, table top	

Bedrock R8000 Drawing

4x WiFi / 4G / 5G antennas

DC input 12V - 60V

Remote power button with LED

45 mm

130 mm

160 mm

Threaded holes for DIN-rail bracket

2x SIM sockets

Power state

S-State
Storage
WiFi
LTE

BIOS Reset pinhole

Power button

2x 2.5 GbE

4x USB 3.2

Console

DisplayPort

2x mini-DP

HDMI

Slot for opening enclosure

Single enclosure screw

Kensington lock

Grounding screw
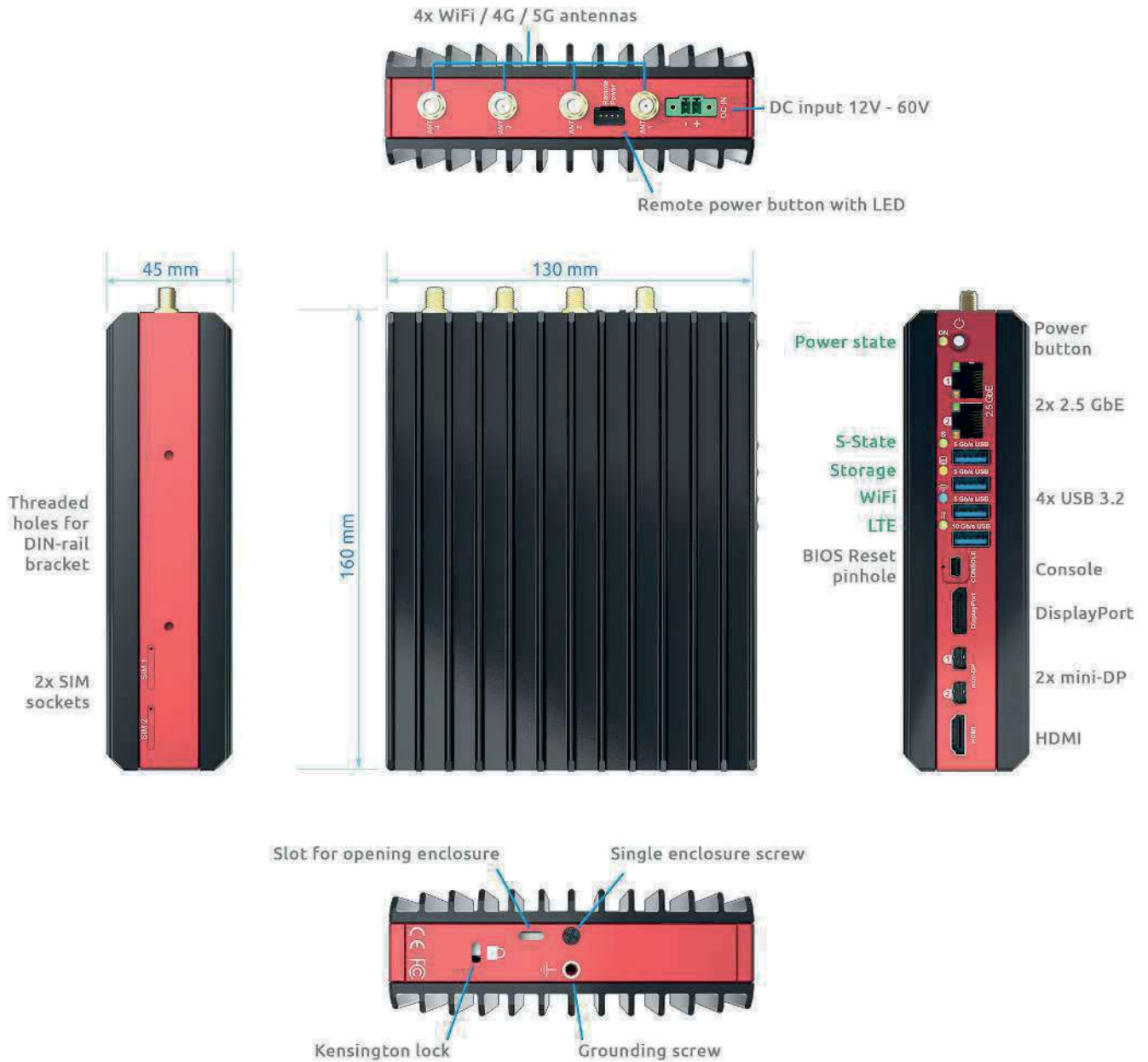
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