



## Main Features

- Powered by AI inference accelerator for railway applications
- Configurable for up to 600W discrete graphics card
- Built-in high performance Intel® Core™ Processor (Series 2)
- Support up to 4 PCIe 5.0/4.0 x16/x8/x4 slots for 5.0/4.0 x16/x8/x4 slots for graphics card GigE frame grabbers
- Ultra speed M.2 Key M NVMe & 4 x 2.5" SSD for data integrity
- RAID 0/1/5/10 configurable for data secure
- DC 24V non-isolated power input with ignition control
- 4 x 2.5GbE PoE, up to PoE++ (IEEE 802.3bt) support
- Rich communication ports: 6 x USB 3.2, 2 x CAN FD, and 4 x UART
- Telemetric functionality with 2 x WWAN/5G NR, 1 x WLAN, and GNSS/DR/RTK support
- Military standard of MIL-STD-810H for anti-vibration/shock
- CE/FCC, UKCA, EN 50155, and EN 45545-2 certified

## Specifications

### Processor

- Intel® Core™ 7/5/3 processor 251E/221E/201E, TDP up to 65W

### Chipset

- Intel® R680E

### Memory

- 2 x DDR5 SO-DIMM, ECC, up to 96GB, 48GB per DIMM

### Storage

- 4 x 2.5" SATA 3.0 SSD (15mm height), removable
- 1 x M.2 Key M 2280 NVMe SSD (PCIe 4.0 x4)

### Expansion Slot

- 1 x Full size Mini PCIe 3.0 x2 slot (USB 3.2, USB 2.0)
  - Option for M.2 Key B (2 x nano-SIM)
- 1 x M.2 Key E (PCIe 3.0 x1, USB 2.0)
  - Support Wi-Fi 5/6 module
- 2 x M.2 Key B 3042/3052 (USB 3.2, USB 2.0)
  - Support LTE/5G NR module
- 1 x PCIe 5.0 x16 3.5 slot-width
  - For discrete graphics card
- 2 x PCIe 4.0 x8 slot
- 1 x PCIe 4.0 x4 slot

### Dedicated GPU (optional)

- Up to NVIDIA® GeForce RTX™ 5090, 600W

### Sensor

- GNSS: u-blox NEO-M9N GNSS module for GPS/GLONASS/QZSS/Galileo/Beidou
- Optional modules with dead reckoning/RTK available
- MEMS: 3D accelerometer and 3D gyroscope, ST LSM6DSLTR

### System Capabilities

- TPM 2.0: Infineon SLB 9672VU2.0 FW15.23

### Display Interface

- 1 x VGA, up to 1920x1200@60Hz
- 2 x HDMI® 2.1, up to 4096x2304@60Hz

### CAN bus (isolation)

- 2 x CAN FD, compatible with CAN 2.0A/2.0B
- Up to 5Mb/s in data transmit, 2.5KV isolated
- IEC 61000-4-2 Electrostatic Discharge (ESD): ± 6KV/8KV (contact/air)

- ISO 11898-1/11898-2

- ESD: ± 8KV/15KV (contact/air), 2.5KV isolated

### DI/DO (isolation)

- 4-Bit input
  - Source: DC 9V~36V (12V@1.1mA/24V@2.2mA)
  - External: DC 0V~33V pull-high, high-level, DC 3.3V-33V; low-level, DC 0V-2V
- 4-Bit output
  - Source: DC 9V~36V (nominal 35mA@24V):
  - External: DC 5V~27V pull-high, sink current w/ 220mA for each bit, 500mA max (@25C)
- Source or external can be selected by software (default: source type)

### Serial Port

- 2 x COM port (DB9, COM1, COM2), supports full RS-232/422/485
- 2 x COM port (DB9, COM3, COM4), supports full RS-232
- RS-232 working voltage, ± 9V, baud rate up to 115.2kb/s
- 2-wire/4-wire RS-485 (Baud rate: 300~115.2Kbps)
- 1 x UART for RTK signal, wafer reserved

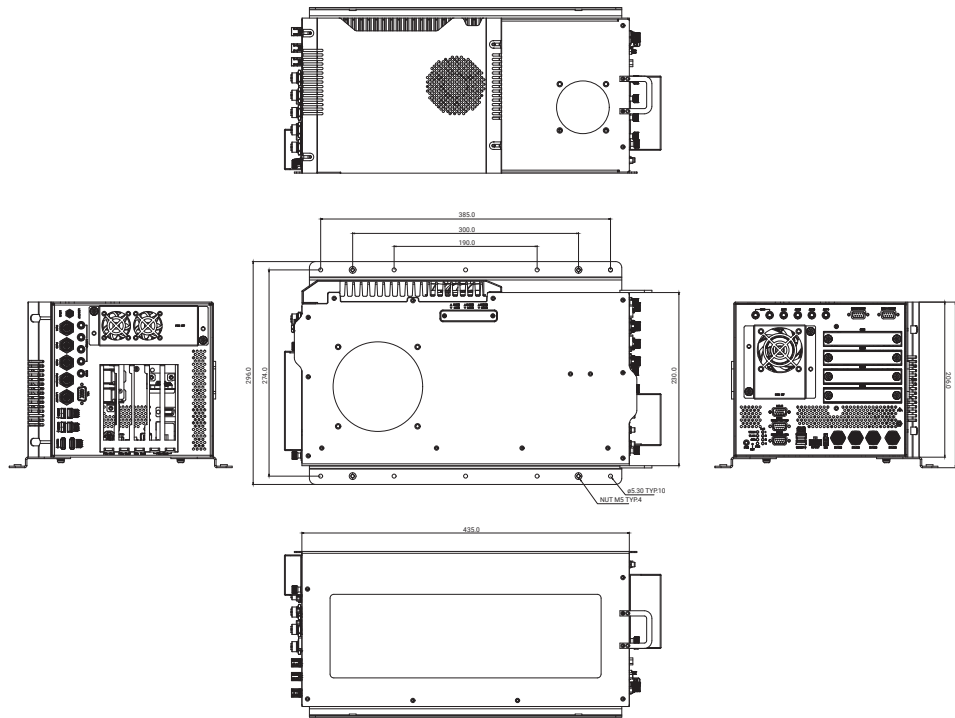
### Power Management

- DC 24V non-isolated power input
- Setting 8-level power on/off delay time by software
- Reverse protection, OCP & UVP
- Ignition on/off control/programmable on/off delay timer
- Connector: 4 x K-coded, separated a 2-pin connector for IGN control

### I/O Interface Front

- 4 x K-coded connector for DC 24V input
- 1 x 2-pin mini-fit for IGN control
- 1 x ATX power button
- 1 x Reset button
- 8 x LED indicator for power/storage/WLAN/WWAN/PoE
- 4 x 2.5" SSD tray
- 2 x USB 3.2 Gen 2, Type-A, 5V/900mA
  - Lock hole reserved
  - Up to 10Gbit/s link speed & compliance with USB 2.0 (LS/FS/HS link speed)
- 2 x COM port (DB9, COM1, COM2)
- 2 x COM port (DB9, COM3, COM4)
- 1 x MULTI-port (DB15, DI/DO + CAN FD)
- 1 x DC out, 12V/3A, terminal block
- 6 x SMA antenna hole
- 2 x USB 2.0, wafer reserved, 5V/500mA

## Dimension Drawing



### I/O Interface Rear

- 4 x USB 3.2 Gen 2, Type-A, 5V/900mA
  - Lock hole reserved
  - Up to 10Gbit/s link speed & compliance with USB 2.0 (LS/FS/HS link speed)
- 2 x HDMI<sup>®</sup>
- 1 x VGA (DB15), up to 1920x1200@60Hz
- 4 x 2.5GbE M12 X-coded PoE connector (LAN1~LAN4, 80W power budget), 1 x 1GbE M12 X-coded connector (LAN5)
  - IEEE 802.3af/at/bt (LAN1~LAN4, LAN1 supports IEEE 802.3bt)
  - 9K byte jumbo frame
  - Support PTP (IEEE 1588)
  - Controller/PHY: Intel<sup>®</sup> I226-I (LAN1~LAN4), Intel<sup>®</sup> I219-LM (LAN5)
  - Support vPro (iAMT) & WoL: LAN5
- 1 x PCIe x16 slot
- 2 x PCIe x8 slot
- 1 x PCIe x4 slot
- 1 x GNSS antenna
- 4 x SMA antenna hole
- 1 x 6-pin M8 connector for 1 x mic in, 1 x line out

### I/O Interface Top

- 2 x nano-SIM slot, one additional in the option

### Vibration & Shock

- Vibration in operating:
  - MIL-STD-810H, 514.8C Procedure 6, Category 4
  - IEC 60068-2-64: 2.0g@5Hz~500Hz
- Vibration in storage:
  - MIL-STD-810H, 514.8E Procedure 1, Category 24, 7.7g
- Shock:
  - MIL-STD-810H, 516.8 Procedure I, trucks and semi-trailers=40g
  - Crash hazard: Procedure V, ground equipment=75g

### Mechanical

- Dimensions: 296mm (W) x 220mm (D) x 435mm (H) w/ mount bracket
- Weight: 8kg (bare bone)

### Environment

- Operating temperature: -30°C~70°C (w/ 80W PoE, fan kit, w/o graphics card)
- Operating temperature: -30°C~55°C (w/ 80W PoE, fan kit, w/ 600W graphics card)
- Storage temperature: -40°C~85°C
- Relative humidity: 10%~95% (non-condensing)

### Certifications

- CE approval, FCC Class A, EN 50155, and EN 45545-2 certified

### Operating System

- Windows 11
- Windows 10, 64-bit
- Windows 10 IoT, 64-bit
- Linux (Ubuntu 22.04, Linux 5.19)

## Ordering Information

### ◆ aROK 8120-AC4F (P/N: 10A20812000X0)

System bare-bone, fan-kit, Intel<sup>®</sup> Core™ 7/5/3 processor, 2 x DDR5 SO-DIMM, 4 x PoE, 1 x LAN, 6 x USB 3.2, 4 x serial, 4 x PCIe slot, DC 24V

### ◆ Options

| CPU  |                 |  |      |
|--|-----------------|--|------|
| Model Name   | P-core + E-core | P-core/E-core Base Freq.                               | TDP  |
| Core™ 7, 251E  | 24 (8+16)       | 2.1GHz/1.6GHz  | 65W  |
| Core™ 7, 251TE                                       | 24 (8+16)       | 1.4GHz/1.0GHz  | 45W  |
| Core™ 5, 221E  | 14 (6+8)        | 2.7GHz/2.1GHz  | 65W  |
| Core™ 5, 221TE                                       | 14 (6+8)        | 1.8GHz/1.3GHz  | 45W  |
| Core™ 3, 201E  | 4 (4+0)         | 3.6GHz/N/A   | 65W  |
| Core™ 3, 201TE                                       | 4 (4+0)         | 2.9GHz/N/A   | 45W  |
| SO-DIMM DDR5 5600MHz                                 |                 |  |      |
| 8GB  | 16GB            | 32GB   | 48GB |
| Graphics card  |                 |  |      |
| NVIDIA <sup>®</sup> GeForce RTX™ 50xx Series (~600W) |                 | NVIDIA <sup>®</sup> Quadro RTX™ 5000/6000/A6000 (300W) |      |
| Others   |                 |  |      |
| 1000W power supply kit (P/N: 10AT0811003X0)          |                 |  |      |