



AI Computing Platform

8F4E1 Datasheet



Issue: V2.0

Date: 2023-08-14

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Change History

8F4E1

| Version | Date | Description of Change | Hardware Version |
|---------|-----------|--|------------------|
| V 1.0 | 2022-3-8 | Initial Release | V 1.0 |
| V 2.0 | 2023-8-14 | <ol style="list-style-type: none"> 1. Change the datasheet template; 2. Change Product description; 3. Remove support for the RTX A6000 graphics card; 4. Add the function description of the AGX Xavier module with the RTX 6000 graphics card; 5. Added the description of interface function test. | V 1.0 |

Hardware Update History

| Version | Date | Description of Change |
|---------|-----------|-----------------------|
| V 1.0 | 2022-3-28 | Initial Version |

Electronic components and circuits are very sensitive to electrostatic discharge, although the company will design the main interface on the board card to do anti-static protection design, but it is difficult to do anti-static safety protection for all components and circuits. Therefore, it is recommended that you take ESD safety measures when handling any circuit board component.



ESD safety measures include but are not limited to the following:

1. Put the card in an ESD bag during transportation or storage. Do not take out the card until installation and deployment.
2. Before touching the board, release the static electricity stored in the body: Wear a grounding wrist strap.
3. Operate circuit boards only in electrostatic discharge safe areas.
4. Avoid moving circuit boards in carpeted areas.
5. Avoid direct contact with electronic components on the board through edge contact.

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1 Description



The 8F4E1 AI Computing platform(8F4E1 for short) can be based on the NVIDIA Jetson AGX Orin / AGX Xavier core modules. It is up to 275 TOPS of AI performance and can be used in education, industrial automation, smart cities and other scenarios. It has abundant external interfaces, and the internal interface devices all adopt wide-temperature models.

When the 8F4E1 is equipped with the AGX Xavier module, it can be adapted to the NVIDIA RTX 6000 GPU and uses the NVIDIA Clara AGX development kit. The NVIDIA Clara AGX development kit comes with end-to-end reference applications for sensor processing, image reconstruction, AI, and visualization, which can help developers get started quickly and reduce overall development time. All necessary libraries and components have been pre-selected to enable an out-of-the-box software development environment. Each reference application utilizes the necessary IO components and drivers to move data and feed it into the processing pipeline on the RTX 6000 GPU, providing a data path setup for functional testing.

2 Specifications

| | Feature |
|--------------------|--|
| Y-C8 | Carrier Board/Development Board/Baseboard |
| Module | NVIDIA Jetson AGX Orin / AGX Xavier Core module |
| Temperature | -20 ~ +65°C |
| Dimensions (W×H×D) | 335mm*257mm*146mm (Including I/O ports and mounting holes) |
| Weight | 5500 g |

Power

| Power Supply | Spec |
|---------------|-------|
| Input Type | AC |
| Input Voltage | +220V |

I/O Port

| Interface | Quantity | Interface | Quantity |
|----------------|----------|--------------------|----------|
| USB 3.0 Type-A | 2 | Micro USB | 1 |
| RJ45 | 2 | HDMI | 1 |
| RS232(DB9) | 2 | Micro SD Card Slot | 1 |
| CAN | 2 | GPIO | 4 |

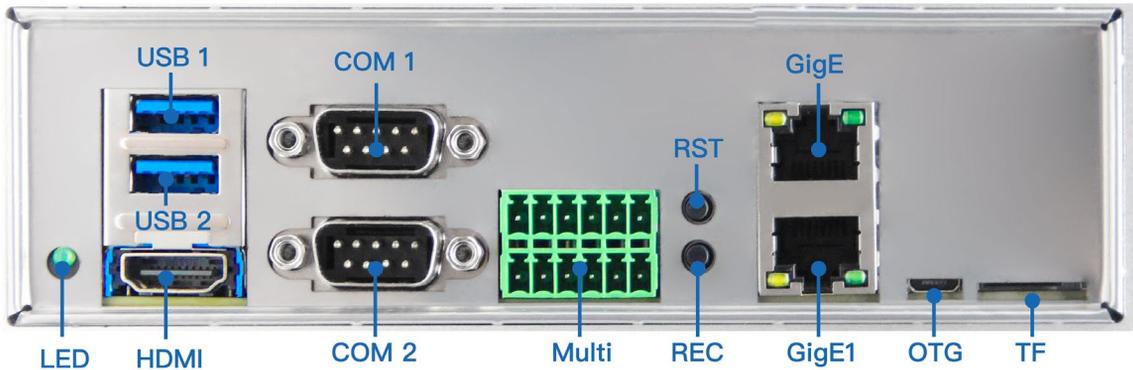
*When used with the Jetson AGX Xavier module, only one USB 3.1 is available and the rest is USB 2.0. One RJ45 network port is non-standard.

NVIDIA Jetson Series Module

Technical Specifications

| Module | Jetson AGX Xavier 32GB | Jetson AGX Xavier 64GB | Jetson AGX Orin 32GB | Jetson AGX Orin 64GB |
|----------------|--|-----------------------------------|--|---|
| AI Performance | 32 TOPS | | 200 TOPS | 275 TOPS |
| GPU | 512-core NVIDIA Ampere architecture GPU with 64 Tensor Cores | | 1792-core NVIDIA Ampere architecture GPU with 56 Tensor Cores | 2048-core NVIDIA Ampere architecture GPU with 64 Tensor Cores |
| CPU | 8-core NVIDIA Carmel Arm® v8.2 64-bit CPU 8MB L2 + 4MB L3 | | 8-core Arm® Cortex®-A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3 | 12-core Arm® Cortex®-A78AE v8.2 64-bit CPU 3MB L2 + 6MB L3 |
| Memory | 32GB 256-bit LPDDR4x 136.5GB/s | 64GB 256-bit LPDDR4x 136.5GB/s | 32GB 256-bit LPDDR5 204.8 GB/s | 64GB 256-bit LPDDR5 204.8 GB/s |
| Storage | 32GB eMMC 5.1 | | 64GB eMMC 5.1 | |
| Video Encode | 4x 4K60 (H.265) 8x 4K30 (H.265) 16x 1080p60 (H.265) 32x 1080p30 (H.265) | | 1x 4K60 (H.265) 3x 4K30 (H.265) 6x 1080p60 (H.265) 12x 1080p30 (H.265) | 2x 4K60 (H.265) 4x 4K30 (H.265) 8x 1080p60 (H.265) 16x 1080p30 (H.265) |
| Video Decode | 2x 8K30 (H.265) 6x 4K60 (H.265) 12x 4K30 (H.265) 26x 1080p60 (H.265) 52x 1080p30 (H.265) | | 1x 8K30 (H.265) 2x 4K60 (H.265) 4x 4K30 (H.265) 9x 1080p60 (H.265) 18x 1080p30 (H.265) | 1x 8K30 (H.265) 3x 4K60 (H.265) 7x 4K30 (H.265) 11x 1080p60 (H.265) 22x 1080p30 (H.265) |
| Power | 10W - 30W | | 15W - 40W | 15W - 60W |

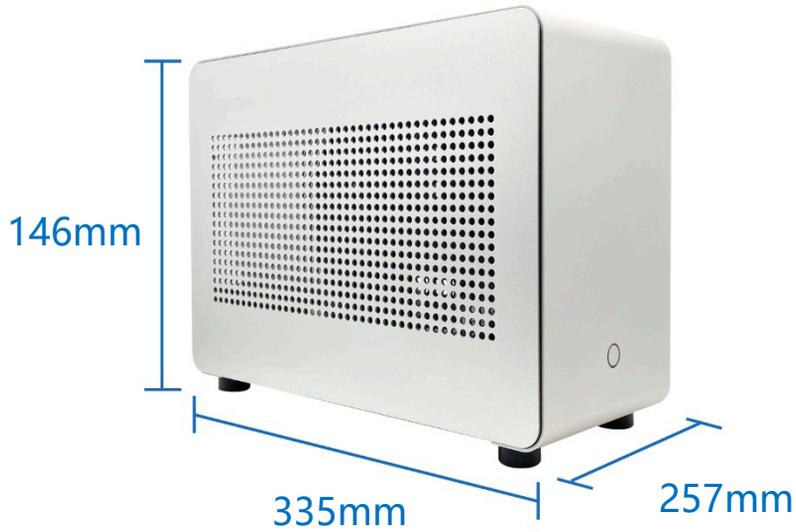
3 Interface Display



8F4E1 Connector

| Sign | Function | Sign | Function |
|---------------|--|---------------|-----------------------------------|
| TF | Micro SD Card Slot | HDMI | Type-A HDMI Connector |
| GigE | 1000BASE-T Ports (Non-standard configuration) | GigE1 | 1000BASE-T Ports (RJ45 Connector) |
| LED | Power led | Multi | Multifunctional IO interface |
| COM1/ COM2 | RS232 serial port (DB9 Connector) | USB1/ USB2 | Type A USB 3.0 Connector |
| RST | Reset button | REC | Recovery button |
| OTG | Type-B Micro USB Connector(only use to flash system) | | |

4 All-Round Display



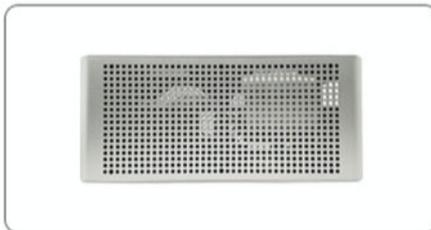
The Front View



The Rear View



The Left/Right View



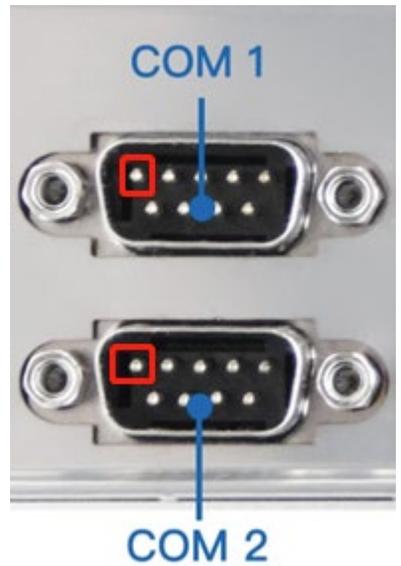
The Top View



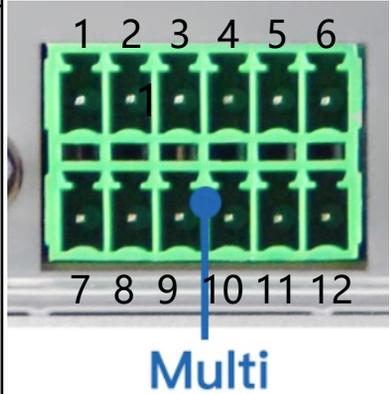
The Bottom View

5 Connector Description

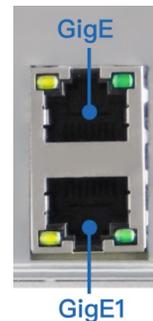
| DB9 Connector (COM1/COM2) | | | | |
|---------------------------|--------------------------------------|-----------------|-------------------|---------------|
| Function | RS232 serial port | | | |
| Sign | COM1/COM2 | | | |
| Type | DB9 Connector | | | |
| Pin definition | pin1: Red frame on the right picture | | | |
| | Pin | Signal | Pin | Signal |
| | 1 | NC | 2 | RX_RS232 |
| | 3 | TX_RS232 | 4 | NC |
| | 5 | GND | 6 | NC |
| | 7 | NC | 8 | NC |
| | 9 | NC | 10 | NC |
| Device Name | Module | AGX ORIN | AGX Xavier | |
| | COM1 | /dev/ttyTHS4 | /dev/ttyTHS1 | |
| | COM2 | /dev/ttyTHS0 | /dev/ttyTHS0 | |



| Multifunctional I/O interface | | | | |
|-------------------------------|--|-------------------|--------------|-----------------|
| Function | CAN\GPIO | | | |
| Sign | Multi | | | |
| Pin definition | Pin | Signal | Pin | Signal |
| | 1 | CAN1_H | 2 | 3.3V |
| | 3 | CAN1_L | 4 | GND |
| | 5 | GND | 6 | GPIO08 |
| | 7 | CAN0_H | 8 | GPIO09 |
| | 9 | CAN0_L | 10 | GPIO17 |
| | 11 | GND | 13 | GPIO27(PWM) |
| | The sequence of signal pins is shown on the right. | | | |
| GPIO | Module | AGX Xavier | | AGX ORIN |
| | Jetpack Version | <Jetpack5.0 | >=Jetpack5.0 | |
| | GPIO08 | 256 | 313 | 325 |
| | GPIO09 | 257 | 314 | 324 |
| | GPIO17 | 417 | 436 | 444 |
| | GPIO27 | 393 | 419 | 433 |



| Networking (GigE/GigE1) | |
|-------------------------|--|
| Function | 10/100/1000M BASE-T Ethernet |
| Sign | GigE/GigE1 |
| Type | Standard RJ45 network connector |
| Notice | The Network port(GigE) is optional. By default, only GigE1 is available. |



6 Ordering Information

| Order type | Description |
|---|---|
| 8F4E1 | Ai computing platform for NVIDIA® Jetson™ ORIN NX/ORIN Nano series core modules |
| If you need to add other functional modules, please confirm the plan with the company's sales and technical personnel in advance. | |

7 Recovery Mode

Jetson core module can work in normal mode and Recovery mode. In Recovery mode, it can perform file system update, kernel update, Bootloader/UEFI update, BCT update and other operations.

To enter the Recovery mode, perform the following steps:

- Power off the system.
- Use a Micro-USB cable to connect the Micro-USB port (OTG) of the 8F4E1 to the Jetson development host USB port.
- The Jetson development host should be Ubuntu18.04 or Ubuntu20.04 based on X86 architecture.
- Press the Recovery key (REC) to power the system. Hold down the Recovery key (REC) for more than 3 seconds, and then release the Recovery key (REC).
- When the system enters Recovery mode, you can perform subsequent operations.

8 Method of Application

- Make sure all external system voltages are off.
- Install necessary external cables. (such as: the display line connected to the HDMI display, the power input line for the system power supply, the USB cable connecting the keyboard and mouse...)
- Connect the power cord to the power supply.
- 8F4E1 The system powers on automatically by default. It can also be set as a switch start, for specific methods, please consult the company's sales and technical personnel.

9 GPIO Test

The 8F4E1 comes with four programmable GPIOs as standard. Programmable output voltage 3.3V, please note that the input voltage does not exceed 3.3V. Take AGX Xavier module, GPIO08 when the system is higher than Jetpack5.0 as an example:

The content after the # in the following command is a comment and does not need to be added when executing the command.

- `sudo su`
- `echo 313 > /sys/class/gpio/export #Enable GPIO`
- `echo out > /sys/class/gpio/PBB.00/direction #Set GPIO direction ,out or in.`
- `echo 1 > /sys/class/gpio/PBB.00/value #Set GPIO out value ,0 or 1`

Note The preceding absolute path name is based on the actual path name generated after GPIO is enabled.

#When set to the input state, you can only read values. When set to the output state, you can read and write values.

```
cat /sys/class/gpio/PBB.00/value
```

The output state can be measured using a multimeter to measure the voltage between the specific lead heel GND.

10 CAN Test

The 8F4E1 is equipped with two CAN channels. If you want to connect an external CAN device to test, connect the CAN_H of the device to the CAN_H of the device under test and the CAN_L to the CAN_L of the device under test. Two CAN buses can also be tested. During the test, connect the CAN0_H of the device to CAN1_H and the CAN0_L to CAN1_L. The test command is as follows :

- `sudo apt-get install busybox can-utils`
- # Writes the specified value to a register
- `sudo busybox devmem 0x0c303018 w 0xc458`
- `sudo busybox devmem 0x0c303010 w 0xc400`
- `sudo busybox devmem 0x0c303008 w 0xc458`
- `sudo busybox devmem 0x0c303000 w 0xc400`
- `sudo modprobe can` # Load the CAN bus subsystem support module.
- `sudo modprobe can_raw` # Load the original CAN protocol module.
- `sudo modprobe mttcan` #Load CAN interface support.
- `sudo ip link set can0 type can bitrate 500000`
Set the CAN0 bit rate to 500k bps
- `sudo ip link set can1 type can bitrate 500000`
Set the CAN1 bit rate to 500k bps
- `sudo ip link set up can0` #Open CAN0
- `sudo ip link set up can1` #Open CAN1
- `candump can0` # Set CAN0 to receive
- `cansend can1 1F223344#1122334455667788`
Open another terminal and send data through CAN1. After sending, there will be data echo on the receiving end of CAN0.

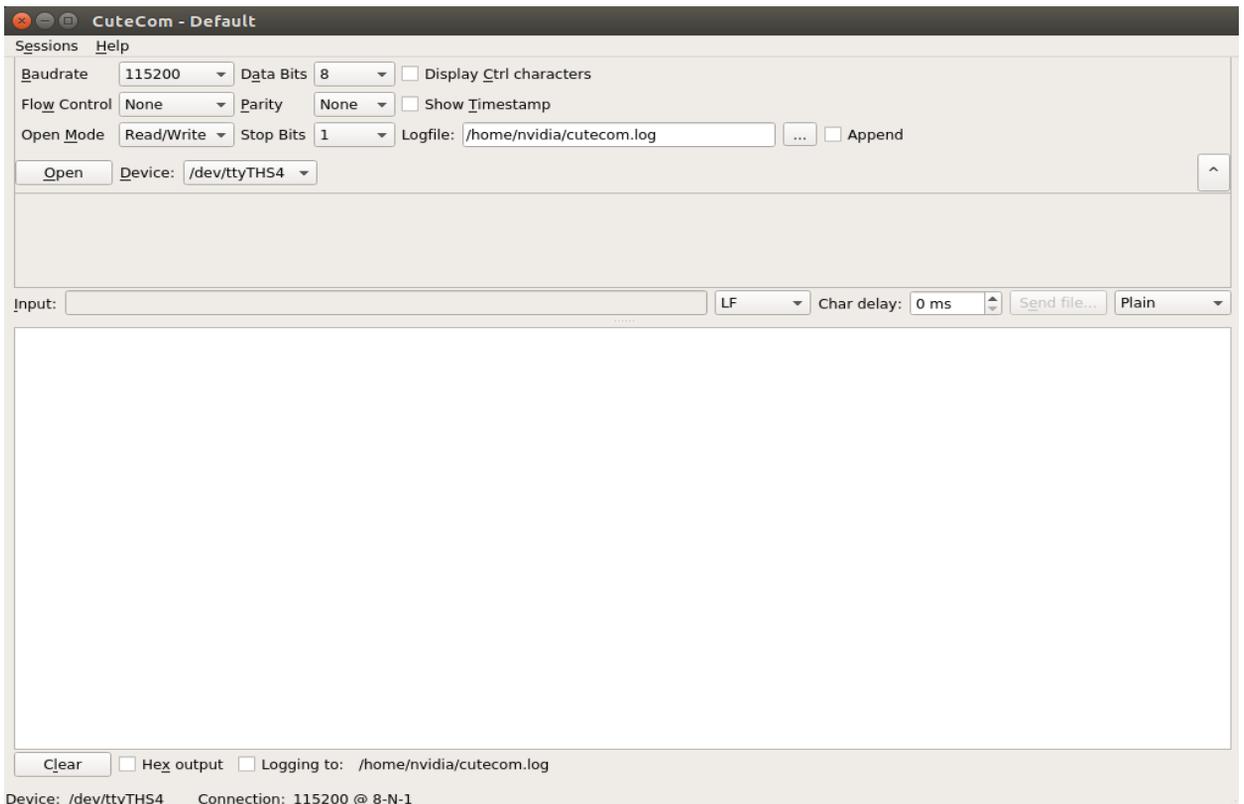
11 RS232 Test

The 8F4E1 is equipped with two RS232 serial ports as standard, which can be used for self-receiving test of a single serial port, and connection of two RS232 serial ports for docking test. Take AGX ORIN as an example. The command is as follows:

- `sudo apt-get install cutecom` #Install the serial port test tool
- `sudo cutecom`

When testing a single serial port, connect the RX of a single serial port to the TX. When two serial ports are connected, the RX of COM1 is connected to the TX of COM2, and the TX of COM1 is connected to the RX of COM2.

The interface of the serial port test tool cutecom is as follows:



12 Special Instructions

- Initial system user name: nvidia, password: nvidia, no password su. If root permissions are required, use sudo to grant permissions, or use sudo su to access the root user.
- The pre-installed system is pure by default and does not contain Jetpack software. You can use the following command to install the software. Do not replace or modify the default software source before installation:
 - `sudo apt-get update`
 - `sudo apt-get install nvidia-jetpack`
- It can also be installed over the network using SDKmanager software.
- For more information please refer to: [Jetson wiki \(plink-ai.com\)](https://wiki.plink-ai.com/jetson)