AI Computing Platform

SYS-2016
Datasheet

Version V2.1

Date   2025-01-09

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Document History

Version	Date	Description of Change	Hardware Version
V 1.0	2022-12-06	Preliminary Release	V 1.0
V 1.1	2023-05-22	Add Jetpack5.* version GPIO map number, serial device name.	V 1.0
V 2.0	2024-02-29	Modify the product manual template; Add interface test description.	V 1.0
V 2.1	2025-01-09	Modify font	V 1.0

Hardware Update History

Version	Date	Description of Change
V 1.0	2022-12-06	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.

Table of Contents

1 Introduction

SYS-2016 is a compact AI industrial computer that can be used with NVIDIA® Jetson™ Xavier NX, Orin NX, and Orin Nano series core modules. For industrial deployment applications, the main interface is designed for electrostatic safety protection, and a highly reliable power application scheme is adopted. The input power supply has overvoltage and reverse polarity protection functions, and there are abundant external interfaces, and the internal interface carrier board devices are wide temperature models.

SYS-2016 adopts large-size cooling fin, and adopts red copper boss and high-performance heat pipe for soaking design, which has good heat conduction and heat dissipation performance, so that the whole machine can adapt to higher ambient temperature scenes. It is suitable for industrial automation, security, new retail and other scenarios.

SYS-2016 standard model can support 1/3/5 full-speed Gigabit Ethernet, if you need to expand SSD memory card, 4G communication module, all kinds of video capture/output cards, AD capture cards, multi-function IO cards, etc., please contact our sales staff.

2 Specifications

	Specific
Carrier Board	Y-C6
Module	NVIDIA Jetson Xavier NX / TX2 NX / Jetson NANO/ Orin NX/Orin Nano Series Modules
Temperature	-20 ~ +65°C
Dimensions (L×W×H)	190mm * 160mm * 76.3mm (Including I/O ports and mounting holes)
Weight	1425g

Power Supply	Spec
Input Type	DC
Input Voltage	+9V ~ +24V

I/O Ports

Interface	Quantity	Interface	Quantity
USB3.0 Type A	1	Micro USB	1
RJ45	1	HDMI	1
DB9（2*RS232/1*Multi)	3	LED	1
Micro SD Card Slot	1	DC power Jack	1
USB2.0 Type A	2	Nano SIM Card Slot	1

# NVIDIA Jetson Series Modules Technical Specifications

| Module	Jetson ORIN NX 16GB	Jetson ORIN NX 8GB	Jetson Orin Nano 8GB	Jetson Orin Nano 4GB
AI Performance	100 TOPS	70 TOPS	40 TOPS	20 TOPS
GPU	1024-core NVIDIA Ampere architecture GPU with 32 Tensor Cores		1024-core NVIDIA Ampere architecture GPU with 32 Tensor Cores	512-core NVIDIA Ampere architecture GPU with 16 Tensor Cores
CPU	8-core Arm® Cortex®-A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3	6-core Arm® Cortex®-A78AE v8.2 64-bit CPU 1.5MB L2 + 4MB L3	6-core Arm® Cortex®-A78AE v8.2 64-bit CPU 1.5MB L2 + 4MB L3	
Memory	16GB 128-bit LPDDR5 102.4GB/s	8GB 128-bit LPDDR5 102.4GB/s	8GB 128-bit LPDDR5 68 GB/s	4GB 64-bit LPDDR5 34 GB/s
Storage	Support external NVME		Support external NVME	
Video Encode	1x 4K60 (H.265) 3x 4K30 (H.265) 6x 1080p60 (H.265) 12x 1080p30 (H.265)		1080p30 supported by 1-2 CPU cores	
Video Decode	1x 8K30 (H.265) 2x 4K60 (H.265) 4x 4K30 (H.265) 9x 1080p60 (H.265) 18x 1080p30 (H.265)		1x 4K60 (H.265) 2x 4K30 (H.265) 5x 1080p60 (H.265) 11x 1080p30 (H.265)	
Power	10W - 25W	10W - 20W	7W - 15W	7W - 10W

NVIDIA Jetson Series Modules Technical Specifications

Module	Xavier NX 16GB	Xavier NX 8GB
AI Performance	21TOPS	
GPU	384-core NVIDIA Volta™ architecture GPU with 48 Tensor Cores	
CPU	6-core NVIDIA Carmel Arm®v8.2 64-bit CPU 6MB L2 + 4MB L3	
Memory	16 128-bit LPDDR4x 59.7GB/s	8GB 128-bit LPDDR4x 59.7GB/s
Storage	16GB eMMC 5.1	
Video Encode	2x 4K60 (H.265) 4x 4K30 (H.265) 10x 1080p60 (H.265) 22x 1080p30 (H.265)	
Video Decode	2x 8K30 (H.265) 6x 4K60 (H.265) 12x 4K30 (H.265) 22x 1080p60 (H.265) 44x 1080p30 (H.265)	
Power	10W – 20W	
Mechanical	69.6mm x 45mm 260-pin SO-DIMM connector	

3 External I/O Ports
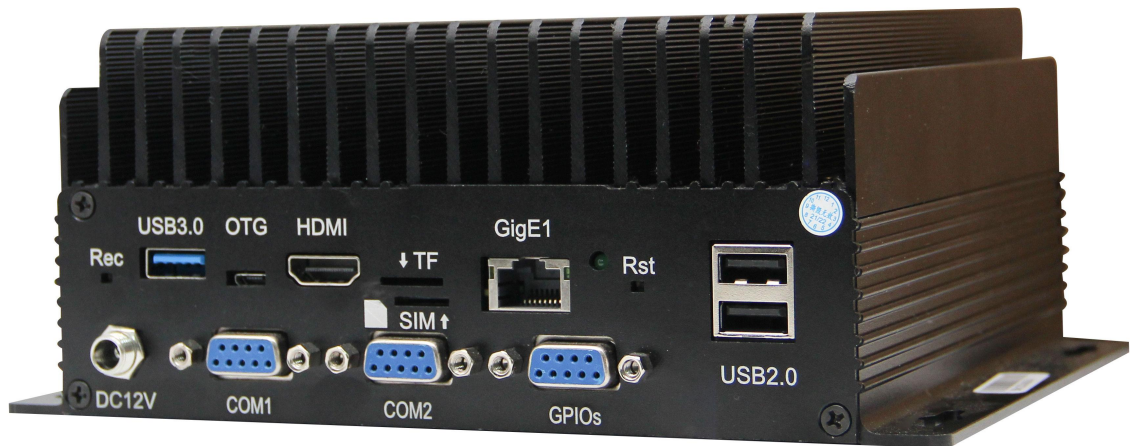
Sign	Function	Sign	Function
Rst	Reset Button	OTG	Type B Micro USB Connector
USB3.0	USB 3.0Type A Connector	GigE1	RJ45 Jack(10/100/1000Mbps Ethernet)
HDMI	Type A HDMI Connector	TF	Micro SD Card Slot
Rec	Recovery Button	SIM	Nano SIM Card Slot
DC12V	DC Power Jack	COM1	RS232 Serial Port
COM2	RS232 Serial Port	GPIOs	Multi-function IO (1*CAN/4*GPIO)
USB2.0	Type A USB Connector（USB2.0）		

4 All-Round Display
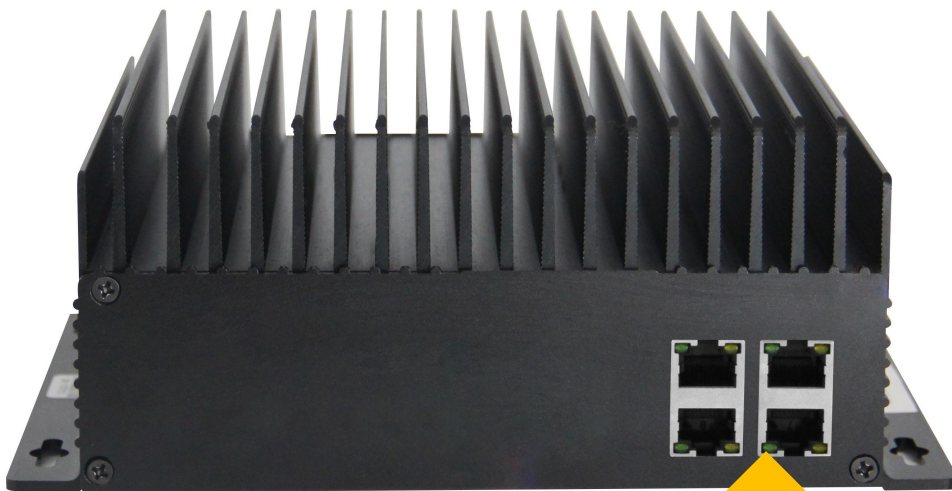
Here are the reserved four network ports
Standard machine for a single network port

5 Connector Description

COM1 & COM2

Function	RS232 Serial Port
Sign	COM1 & COM2
Type/Model	DB9 Connector

COM1   COM2

Pin definition

Pin	Signal	Pin	Signal
1	NC	2	TX
3	RX	4	NC
5	GND	6	NC
7	NC	8	NC
9	NC		

The device filenames mapped by COM1 and COM2 on Linux systems are shown in the following table:

	COM1	COM2
Xavier NX	/dev/ttyTHS1	/dev/ttyTHS0
Orin NX	/dev/ttyTHS1	/dev/ttyTHS0
Orin Nano	/dev/ttyTHS1	/dev/ttyTHS0

Pin 1 position: right picture identification.

GPIOs

Function	Multi-function IO Connector
Sign	GPIOs
Type/Model	DB9 Connector

Pin definition

Pin	Signal	Pin	Signal
1	3.3V	2	CAN_L
3	CAN_H	4	GND
5	GND	6	GPO1
7	GPIO2	8	GPIO3
9	GPIO4		

The resulting GPIO mapping numbers are shown in the following table. GPIO high level voltage is 3.3V. Among them, GPO1 can only be used as an output, providing a current that can directly light the LED lamp bead.

	L4T version	GPO1	GPIO2	GPIO3	GPIO4
Xavier NX	<= L4T 32.*	436	422	268	393
	>L4T 32.*	453 (PS.04)	441 (PQ.06)	321 (PCC.04)	419 (PN.01)
Orin NX		492 (PAC.06)	454 (PQ.06)	433 (PN.01)	391 (PH.00)
Orin Nano		492 (PAC.06)	454 (PQ.06)	433 (PN.01)	391 (PH.00)

Description:
Take the Xavier NX module, GPO1, as an example, if the system version is L4T 32.*, run this command:
  $ echo 436 > /sys/class/gpio/export
After GPIO is enabled, the corresponding file name is generated: gpio436;

Then system version is later then L4T 32.*, run this command:
  $ echo 453 > /sys/class/gpio/export
After GPIO is enabled the corresponding file name is generated: PS.04.

6 Ordering Information

Order Type	Function
SYS-2016	Compact AI industrial computer with NVIDIA® Jetson™ Xavier NX/Orin NX/Orin Nano core module.

E-commerce Platform

Taobao Store Address：https://shop333807435.taobao.com/

Jingdong Store Address：https://mall.jd.com/index-11467104.html?from=pc

Ali International Station Address：https://plink-ai.en.alibaba.com/

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 SYS-2016 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 cable to the power supply.(Make sure that the heat dissipation device on the core module is installed before power-on)
- For a system without a protective cover, do not move the hardware system after the system is powered on. Do not touch the circuit board or any electronic components on the circuit board with your body.

9 GPIO Test

SYS-2016 leads to the 4-way CPIO of the Jetson core modules. Programmable output voltage 3.3V, please note that the input voltage does not exceed 3.3V. Take the Xavier NX 8GB module，L4T35.3.1，GPIO1 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 388 > /sys/class/gpio/export   # Enable GPIO（Or initialize GPIO)
- echo out > /sys/class/gpio/gpio388/direction
          #Set the GPIO input and output directions to out or in.
- echo 1 > /sys/class/gpio/gpio388/value
          # Set the GPIO output high/low level to 1 for high and 0 for low.

#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/gpio388/value   #Get GPIO value.

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

10 CAN Test

SYS-2016 with Jetson module comes standard with one CAN. If you need 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. The test command is as follows:

- sudo apt-get install busybox can-utils

#Writes the specified value to a register

- sudo busybox devmem 0x0c303020 w 0x458
- sudo busybox devmem 0x0c303018 w 0x400
- sudo busybox devmem 0x0c303010 w 0x458
- sudo busybox devmem 0x0c303008 w 0x400
- 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 CAN0 bit rate to 500k bps
- sudo ip link set can1 type can bitrate 500000

  # Set 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 to send data through CAN1. After sending, there will be data echo at the receiving end of CAN0.

   See links for different module register values :

     Controller Area Network (CAN) — Jetson Linux Developer Guide documentation (nvidia.com)

11 Serial Port Test

SYS-2016 is equipped with two RS232 serial ports as standard when it is paired with Jetson module, which can be used for self-collecting test of a single serial port and interconnection test of two serial ports. The command is as follows:

- sudo apt-get install cutecom   #Install the serial port test tool
- sudo cutecom   # For a single-serial port test, you only need to open one cutecom interface on each terminal. For a two-serial port connection test, use two terminals and open two cutecom interfaces.
- When testing a single serial port, connect the RX of a single serial port to the TX. When the two serial ports are connected, the RX of UART1 is connected to the TX of UART2, and the TX of UART1 is connected to the RX of UART2.

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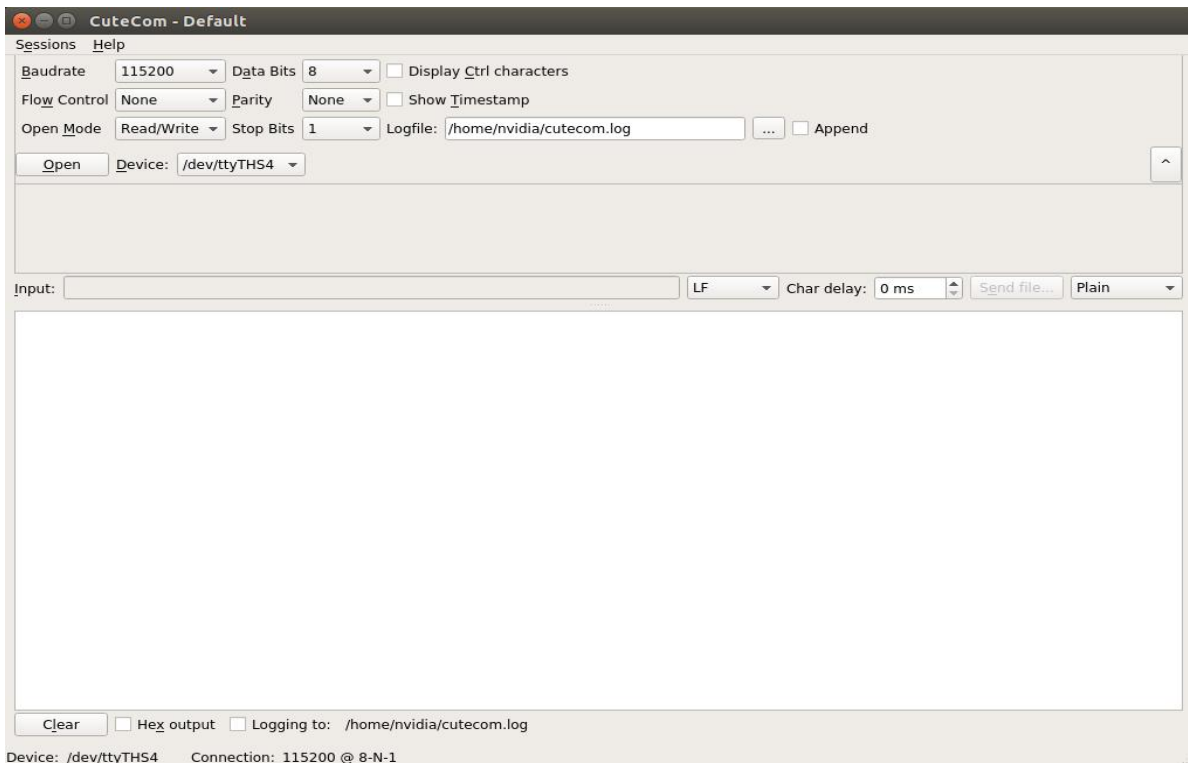
12 Special Instructions

- Initial system username: **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)