

RTSO-1001

Product Manual

Realtimes Beijing Technology Co., LTD.

Fax: +86 010-84284669 / 84280996

Email: info@realtimes.cn

Web Page: <http://www.realtimesai.com>

Address: 11th Floor, Block B, 20th Heping Xiyuan, Pingxi Street, Chaoyang District, Beijing 100013, P.R.China



Revision History

Revision	Date	Reason for change	Applicable hardware version	Editor
V1.0	2019-10	Initial release	V1.0	
V1.1	2019-11	Replace the picture	V1.1	
V1.2	2020-02	Update relevant information	V1.1	RT0086
V1.3	2021-09	Added support for AGX AGX Xavier /AGX Xavier industry industry	V1.1	RT0086
V1.4	2021-12	Change the picture, change the straight needle to the curved needle	V1.1	RT0086
V1.5	2022-03	Add software version supporting instructions	V1.1	RT0086



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Electronic components and circuits are very sensitive to electrostatic discharge. Although our company designs anti-static protection for the main interfaces on the card when designing circuit board products, it is difficult to achieve anti-static safety protection for all components and circuits. Therefore, it is recommended to observe anti-static safety precautions when handling any circuit board component (including RTSO-1001). Anti-static safety protection measures include, but are not limited to the following:

- a) The smart box should be placed in an anti-static bag during transportation and storage, and then the board should not be taken out during installation and deployment.
- b) Before touching the smart box, discharge the static electricity stored in the body: wear a discharge grounding wrist strap.
- c) Operate the smart box only within the safe area of the electrostatic discharge point.
- d) Avoid moving smart boxes in carpeted areas.

Precautions and after-sales maintenance

matters needing attention

Before using the product, please read this manual carefully and keep it for future reference;

- Please pay attention to and follow all warning and guidance information marked on the product;
- Please use matching power adapter to ensure the stability of voltage and current;
- Please use this product in a cool, dry and clean place;
- Do not use this product in cold and hot alternate environment to avoid condensation damage components;
- Do not splash any liquid on the product. Do not use organic solvent or corrosive liquid to clean the product;
- Do not use the product in dusty and messy environment. If it is not used for a long time, please pack the product;
- Do not use in the environment with excessive vibration, any dropping or knocking may damage the circuit and components;
- Do not plug and unplug the core board and peripheral modules when power is on;
- Please do not repair or disassemble the product by yourself. In case of any fault, please contact our



company in time for maintenance;

- Do not modify or use unauthorized accessories by yourself, and the damage caused will not be warranted;

After sales maintenance

1) Warranty period

- Base plate, core plate : 3 year (non-human damage)
- Other peripherals sold by the company: 1 year (non-human damage)

2) Warranty description

- Within 7 days: the product (base plate, core module) is not damaged by human, our company will replace / repair it free of charge, and bear the return freight; (because the core module needs NVIDIA to confirm that it can meet the requirements of repair, it will take a long time, we will coordinate as soon as possible, please forgive for the inconvenience)

- From 7 days to 36 months: the product (base plate, core module) is not damaged by human, our company will repair it free of charge, and bear the return freight; (because the core module needs NVIDIA to confirm that it can meet the requirements of repair, it will take a long time, we will coordinate as soon as possible, please forgive for the inconvenience)

- Artificial damage in more than 3 year or 3 year: the product (carrier plate) shall be tested after it is sent to the customer, and the customer shall be informed of whether it can be repaired and the maintenance cost in detail. After reaching an agreement, the product shall be repaired and returned to the customer, and the company shall bear the return freight;

- Starting time: the core module is subject to the original factory delivery time, and the loading plate is subject to the express delivery receipt date;

3) Contact information

Official website: www.realtimesai.com

Taobao website: <https://shop340963258.taobao.com/>

Address: 11, block B, Heping Xiyuan, Heping West Street, Chaoyang District, Beijing

Attention: RMA

Tel: 010-84284669

Mailing notice: contact with the company's sales department in advance, arrange technical support personnel to check and eliminate errors caused by misoperation as soon as possible, fill in the product after-sale return to factory maintenance form after verification, and send it to rma@realtimes.cn Mail box, please attach the list of items to facilitate verification, so as to avoid loss and loss in the process of express delivery. The company does not receive any delivery

Technical support and development customization

1. Scope of technical support

- 1) The company releases the electrical characteristics and use of industrial carrier boards and modules;
- 2) Physical dimension of hardware, relevant structure diagram and line sequence definition of specific interface;
- 3) Burn in verification of all BSP support packages provided by the company;
- 4) The company released burn environment construction, entry-level use. ;
- 5) Various peripheral module drivers released by the company;
- 6) The company's product fault diagnosis and after-sales maintenance services;



2. Scope of technical discussion

Due to the wide range of embedded system knowledge and various types of involvement, we can not guarantee that all kinds of questions can be answered one by one. The following content is not available for technical support, only suggestions can be provided.

- 1) Knowledge beyond the course published by our company;
- 2) Specific software program design;
- 3) Technical support for industrial carrier not issued by the company;
- 4) All kinds of driving support for industrial carrier board not issued by the company;
- 5) Hardware principle and drive design of peripheral module not issued by our company;

3. Technical support mode

- 1) Official website or email questions (recommended): <http://www.realtimesai.com/cn/download.html>
techsupport@realtimes.cn
- 2) Official Taobao through Alibaba Wangwang consultation: <https://shop340963258.taobao.com/>
- 3) Wechat group consultation (wechat Group No. consults Taobao customer service or sales, and Taobao purchase order No. needs to be provided for verification);
- 4) Technical support email: techsupport@realtimes.cn
- 5) Tel: 010-84284669

4. Technical support time

Monday to Friday; 8:30-12:00 am; 1:00-17:30 PM;

The company arranges the rest according to the national legal holidays, during which it may not be able to provide technical support, please send the problem to the technical support email. We will reply to you as soon as possible on weekdays.

5. Complaints and suggestions

If you are not satisfied with us or have suggestions, you can send an email to yu.qin@realtimes.cn For feedback, please call 010-84284669 for further improvement.

6. Customized development services

The company provides the embedded operating system driver based on NVIDIA Jetson series and the paid customized development service of hardware carrier board to shorten your product development cycle.

Please email the request to info@realtimes.cn

Data acquisition and subsequent update

1. Access to information

Download on our website

The company's website contains supporting information of its products, including product user manual, NVIDIA Jetson series module data manual, BSP driver support package for carrier board, supporting peripheral driver files, interface test verification method, FAQ, system burning guide, etc. get into www.realtimesai.com, select "data download" in the navigation bar, find the data you need, and click download.

2. Subsequent updates

Updates of subsequent documents, BSP, driver files and other official account will be updated in time. We will pay close attention to our developments in order to ensure that your information is up to date. We will push through WeChat public.

Product presentation

1 Introduction

NVIDIA Jetson AGX Xavier /AGX Xavier industry module is a machine for deep learning processor launched by NVIDIA, computing power is powerful, modular Small group area. Mainly aimed at the rapid development of artificial intelligence market in recent years, such as unmanned aerial vehicle, automatic driving system, etc., with a relatively wide range Broad application prospects. Rtso-1001 is the industrial-grade loading board for AGX Xavier /AGX Xavier industry, operating temperature -40°C -- +80°C, low power consumption, safety level High, can meet a variety of harsh conditions. The product has passed ISO:9001:2015 certification.

1.1 Features

- Compatible with NVIDIA Jetson AGX Xavier /AGX Xavier industry module
- 1x USB Type-c3.0 interface, providing 5V/1A output power
- 1x USB Type-c3.1 interface(P10),Support system burning function, provide 5V/1A output power
- 2 x USB TYPE A 3.0 interface,Support usb, the start signal, provide 1 a output current
- 1 x USB 2.0 Micro interface,As a slave interface, connect AGX Xavier /AGX Xavier industry's

UART2 and UART3(debug port)

- 2 x Gigabit Ethernet(10/100/1000Mbps self-adaption;Half duplex/full duplex adaptive)
- 1 x RTC battery interface,And the board card is built in supercapacitor
- 1 x Micro SD&UFS card slot
- 1 x Micro SIM card slot
- 2 x HDMI TYPE A interface
- 1 x Mini-PCIE interface
- 1 x Camera interface
- 1 x Fan control interface
- 2 x M.2 key M interface
- 1 x M.2 key E interface
- 4 x 3.3V Bit programmable GPIO
- 3 x 3.3V UART interface
- 2 x CAN interface
- 1 x SPI interface
- 1 x 3.3V I2C interface
- 1 x I2S interface
- Size: 105mm×105mm×29.5mm
- Power input:+9V~+20V
- Temperature:-40~+85°C
- Weight: 105g

1.2 Ordering Information

Model Options	Description
RTSO-1001	2 x HDMI,1 x Micro SD/UFS,1 x M.2 KEY E,2 x M.2 KEY M, 2 x GbE,2 x USB 3.0,2 x USB TYPE C,1 x MIPI(6 x 2 LANE/4 x 4 LANE),1 x MINI PCIE,3 x UART,1 x SPI,1 x I2C,1 x I2S, 4 x GPIO,2 x CAN, RoHS Compliant, provide RTSO-1001 Linux4Tegra software pack
RTSV-6911i(optional) RTSV-6901(optional) RTSV-6941(optional)	Mini-pcie Video Capture Card ,RTSV-6911i (8-channel D1 NTSC/PAL video input), RTSV-6901 (single-channel SDI video input), RTSV-6941 (single-channel HDMI Video Input)
RTS-PM.2.M (optional)	mini-PCIe To M.2 interface card
RTSV-6902(optional) RTSV-6904(optional)	M.2 Video capture card,RTSV-6902 (dual-channel SDI video input), RTSV-6904 (four-channel SDI Video input)
ME909S-821(optional)	mini-PCIe Full netcom 4G module

Order online

<https://shop340963258.taobao.com>

<https://mall.jd.com/index-824786.html>

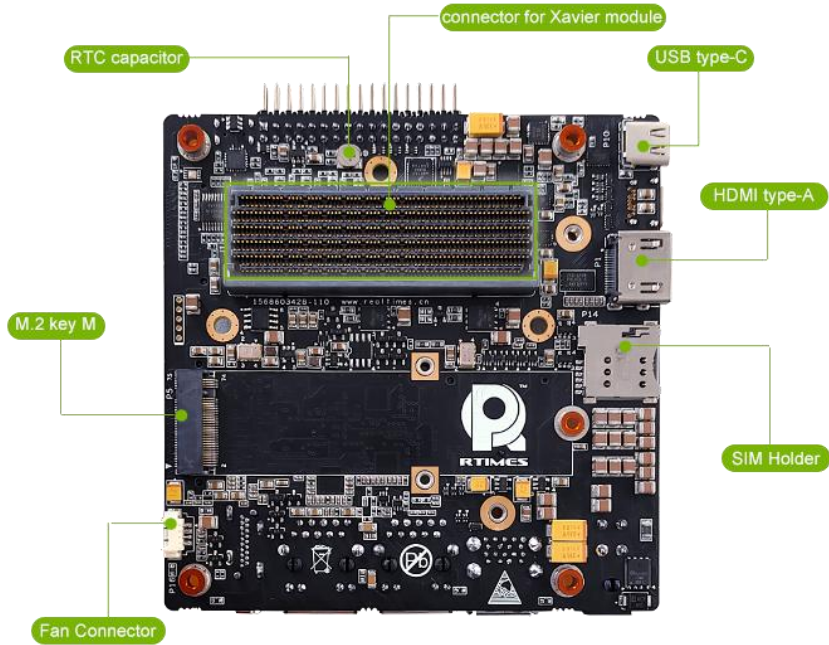
1.3 Wiring package configuration

Out of Cables packing orders for RTSO-1001 are: RTSO-1001-Cables. Contains the following components:

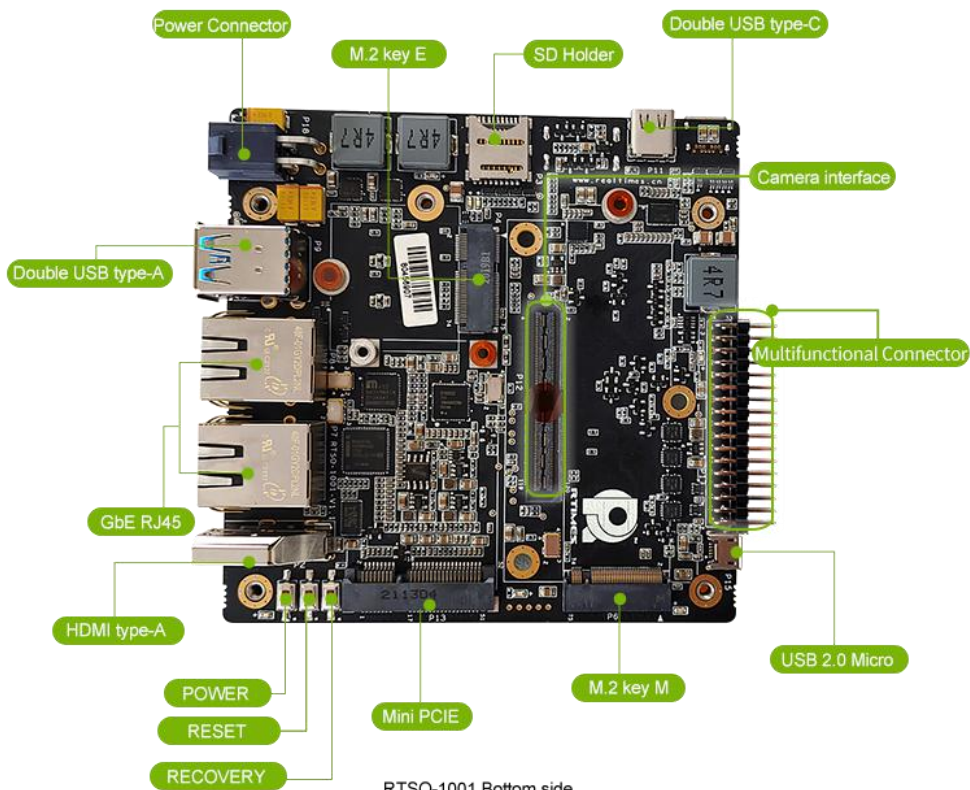
Component	Number	Functional
TYPE-C turn TYPE-A	2	Convert the Type-a interface to the Type-a interface
Multifunctional line	1	3x3.3V UART/6x3.3V GPIO,1x3.3V SPI/4x3.3V GPIO ,1x3.3V I2C,1x3.3V I2S /4x3.3V GPIO,4x3.3V GPIO
RTC battery	1	3V RTC battery

Product specifications

1 External interface function and location



RTSO-1001 Top side



RTSO-1001 Bottom side

1.1 Functional connector

Marking	Function description
J1	699 Pin, Connect to the NVIDIA Jetson AGX Xavier /AGX Xavier industry core module
P16	Connect external cooling fan
P14	Micro SIM card slot
P5/P6	M.2 Key M interface
P1/P2	HDMI display interface
P10/P11	USB TYPE-C connector
P13	The Mini PCIE slots
P12	Camera interface
P4	M.2 Key E interface
P17	Function pin insertion
P3	SD card slot
P18	power interface
P9	Dual USB Type-a interface
P7/P8	Ethernet connector
P15	Usb 2.0 Micro connector

1.2 Button


Marking	Function description
RESET	RESET button is used to restart the core module
POWER	POWER button is used for system shutdown and POWER on after soft shutdown
RECOVERY	RECOVERY button is used to put the core module into recovery mode

1.3 Indicator light


Indication sign	Function description
MCU LED	Blink - Core starts properly
POWER IN LED	Bright - Power supply
CARRIER POWER LED	Bright -Loads start normally

2 Connectors Description


2.1 module interface

Function	Connect to the NVIDIA Jetson AGX Xavier /AGX Xavier industry core module	
Marking	J1	
Type	699-Pin SO-DIMM	
Pin define	For the pin definition of the connector, see the pin definition instructions in the NVIDIA Jetson AGX Xavier /AGX Xavier industry Core Module data book.	

2.2 Fan interface

Function	Connect external cooling fan														
Marking	P16														
Type	Molex PicoBlade Header														
Pin define	<table border="1"> <thead> <tr> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>GND</td> <td>2</td> <td>+5V</td> </tr> <tr> <td>3</td> <td>TACH</td> <td>4</td> <td>PWM</td> </tr> </tbody> </table>	Pin	Signal	Pin		Signal	1	GND	2	+5V	3	TACH	4	PWM	Pin 1: Mark in the red box of the picture on the right.
Pin	Signal	Pin	Signal												
1	GND	2	+5V												
3	TACH	4	PWM												

2.3 Micro SIM card slot

Function	Micro SIM card slot																						
Marking	P14																						
Type	Micro SIM																						
Pin define	<table border="1"> <thead> <tr> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>UIM_PWR</td> <td>2</td> <td>UIM_RESET</td> </tr> <tr> <td>3</td> <td>UIM_CLK</td> <td>4</td> <td>NC</td> </tr> <tr> <td>5</td> <td>GND</td> <td>6</td> <td>NC</td> </tr> <tr> <td>7</td> <td>UIM_DATA</td> <td>8</td> <td>NC</td> </tr> </tbody> </table>	Pin	Signal	Pin		Signal	1	UIM_PWR	2	UIM_RESET	3	UIM_CLK	4	NC	5	GND	6	NC	7	UIM_DATA	8	NC	
Pin	Signal	Pin	Signal																				
1	UIM_PWR	2	UIM_RESET																				
3	UIM_CLK	4	NC																				
5	GND	6	NC																				
7	UIM_DATA	8	NC																				

2.4 M.2 key M interface

Function	M.2 interface			
Marking	P5/P6			
Type	Key M			
Pin define	Pin	Signal	Pin	Signal
	1	GND	2	3.3
	3	GND	4	3.3
	5	PCIE_RX3_N	6	NC
	7	PCIE_RX3_P	8	NC
	9	GND	10	LED
	11	PCIE_TX3_N	12	3.3
	13	PCIE_TX3_P	14	3.3
	15	GND	16	3.3
	17	PCIE_RX2_N	18	3.3
	19	PCIE_RX2_P	20	NC
	21	GND	22	NC
	23	PCIE_TX2_N	24	NC
	25	PCIE_TX2_P	26	NC
	27	GND	28	NC
	29	PCIE_RX1_N	30	NC
	31	PCIE_RX1_P	32	NC
	33	GND	34	NC
	35	PCIE_TX1_N	36	NC
	37	PCIE_TX1_P	38	NC
	39	GND	40	PCIE_CLK
	41	PCIE_RX0_N	42	PCIE_DATA
	43	PCIE_RX0_P	44	ALERT
	45	GND	46	NC
	47	PCIE_TX0_N	48	NC
	49	PCIE_TX0_P	50	PERST#
	51	GND	52	CLKREQ#
	53	PCIE_CLK_N	54	PEWAKE#
	55	PCIE_CLK_P	56	NC
	57	GND	58	NC
59	GND	60	GND	
61	GND	62	GND	
63	GND	64	GND	
65	GND	66	GND	
67	NC	68	SUSCLK(32KHZ)	
69	NC	70	3.3	



	71	GND	72	3.3
	73	GND	74	3.3
	75	GND	76	

2.5 HDMI Display Interface

Function	HDMI display interface																																															
Marking	P1/P2																																															
Type	HDMI																																															
Pin define	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>TMDS Data2+</td> <td>2</td> <td>TMDS Data2 GND</td> </tr> <tr> <td>3</td> <td>TMDS Data2-</td> <td>4</td> <td>TMDS Data1+</td> </tr> <tr> <td>5</td> <td>TMDS Data1 GND</td> <td>6</td> <td>TMDS Data1-</td> </tr> <tr> <td>7</td> <td>TMDS Data0+</td> <td>8</td> <td>TMDS Data0 GND</td> </tr> <tr> <td>9</td> <td>TMDS Data0-</td> <td>10</td> <td>TMDS Clock+</td> </tr> <tr> <td>11</td> <td>TMDS Clock GND</td> <td>12</td> <td>TMDS Clock-</td> </tr> <tr> <td>13</td> <td>CEC</td> <td>14</td> <td>No Connect</td> </tr> <tr> <td>15</td> <td>DDC clock</td> <td>16</td> <td>DDC data</td> </tr> <tr> <td>17</td> <td>DDC GND</td> <td>18</td> <td>+5V Power</td> </tr> <tr> <td>19</td> <td>Hot Plug Detect</td> <td></td> <td></td> </tr> </tbody> </table>				Pin	Signal	Pin	Signal	1	TMDS Data2+	2	TMDS Data2 GND	3	TMDS Data2-	4	TMDS Data1+	5	TMDS Data1 GND	6	TMDS Data1-	7	TMDS Data0+	8	TMDS Data0 GND	9	TMDS Data0-	10	TMDS Clock+	11	TMDS Clock GND	12	TMDS Clock-	13	CEC	14	No Connect	15	DDC clock	16	DDC data	17	DDC GND	18	+5V Power	19	Hot Plug Detect		
Pin	Signal	Pin	Signal																																													
1	TMDS Data2+	2	TMDS Data2 GND																																													
3	TMDS Data2-	4	TMDS Data1+																																													
5	TMDS Data1 GND	6	TMDS Data1-																																													
7	TMDS Data0+	8	TMDS Data0 GND																																													
9	TMDS Data0-	10	TMDS Clock+																																													
11	TMDS Clock GND	12	TMDS Clock-																																													
13	CEC	14	No Connect																																													
15	DDC clock	16	DDC data																																													
17	DDC GND	18	+5V Power																																													
19	Hot Plug Detect																																															



2.6 USB TYPE-C interface

Function	USB interface																																																							
Marking	P10/P11																																																							
Type	TYPE-C																																																							
Pin define	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th>Pin</th> <th>Signal</th> <th>Pin</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>GND_A1</td> <td>B1</td> <td>GND_B1</td> </tr> <tr> <td>A2</td> <td>TX1_P</td> <td>B2</td> <td>TX2_P</td> </tr> <tr> <td>A3</td> <td>TX1_N</td> <td>B3</td> <td>TX2_N</td> </tr> <tr> <td>A4</td> <td>VBUS_A4</td> <td>B4</td> <td>VBUS_B4</td> </tr> <tr> <td>A5</td> <td>CC1</td> <td>B5</td> <td>CC2</td> </tr> <tr> <td>A6</td> <td>D1_P</td> <td>B6</td> <td>D2_P</td> </tr> <tr> <td>A7</td> <td>D1_N</td> <td>B7</td> <td>D2_N</td> </tr> <tr> <td>A8</td> <td>SBU1</td> <td>B8</td> <td>SUB2</td> </tr> <tr> <td>A9</td> <td>VBUS_A9</td> <td>B9</td> <td>VBUS_B9</td> </tr> <tr> <td>A10</td> <td>RX2_N</td> <td>B10</td> <td>RX1_N</td> </tr> <tr> <td>A11</td> <td>RX2_P</td> <td>B11</td> <td>RX1_P</td> </tr> <tr> <td>A12</td> <td>GND_A12</td> <td>B12</td> <td>GND_B12</td> </tr> </tbody> </table> <p>注：P10 口可用于系统烧写</p>				Pin	Signal	Pin	Signal	A1	GND_A1	B1	GND_B1	A2	TX1_P	B2	TX2_P	A3	TX1_N	B3	TX2_N	A4	VBUS_A4	B4	VBUS_B4	A5	CC1	B5	CC2	A6	D1_P	B6	D2_P	A7	D1_N	B7	D2_N	A8	SBU1	B8	SUB2	A9	VBUS_A9	B9	VBUS_B9	A10	RX2_N	B10	RX1_N	A11	RX2_P	B11	RX1_P	A12	GND_A12	B12	GND_B12
Pin	Signal	Pin	Signal																																																					
A1	GND_A1	B1	GND_B1																																																					
A2	TX1_P	B2	TX2_P																																																					
A3	TX1_N	B3	TX2_N																																																					
A4	VBUS_A4	B4	VBUS_B4																																																					
A5	CC1	B5	CC2																																																					
A6	D1_P	B6	D2_P																																																					
A7	D1_N	B7	D2_N																																																					
A8	SBU1	B8	SUB2																																																					
A9	VBUS_A9	B9	VBUS_B9																																																					
A10	RX2_N	B10	RX1_N																																																					
A11	RX2_P	B11	RX1_P																																																					
A12	GND_A12	B12	GND_B12																																																					



2.7 Mini PCIE slot

Function	Mini PCIE slot			
Marking	P13			
Type	Mini PCIE			
Pin define	Pin	Signal	Pin	Signal
	1	WAKE	2	3.3V
	3	NC	4	GND
	5	NC	6	1.5V
	7	PCIE_CLKREQ	8	UIM_PWR
	9	GND	10	UIM_DATA
	11	PCIE_C4_CLK-	12	UIM_CLK
	13	PCIE_C4_CLK+	14	UIM_RESET
	15	GND	16	NC
	17	NC	18	GND
	19	NC	20	W_DISABLE
	21	GND	22	PCIE_REST
	23	PCIE_C4_RX-	24	3.3V
	25	PCIE_C4_RX+	26	GND
	27	GND	28	1.5V
	29	GND	30	I2C_GP5_CLK
	31	PCIE_C4_TX-	32	I2C_GP5_DAT
	33	PCIE_C4_TX+	34	GND
	35	GND	36	USB3_DN
	37	GND	38	USB3_DP
	39	VCC_3V3_PCIE	40	GND
	41	VCC_3V3_PCIE	42	NC
	43	GND	44	NC
	45	NC	46	NC
	47	NC	48	1.5V
	49	NC	50	GND
	51	NC	52	3.3V



2.8 Camera interface

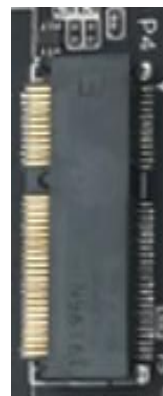
Function	Camera interface			
Marking	P12			
Pin define	Pin	Signal	Pin	Signal
	1	CSI_0_D0_P	2	CSI_1_DO_P
	3	CSI_0_D0_N	4	CSI_1_DO_N
	5	GND	6	GND
	7	CSI_0_CLK_P	8	CSI_1_CLK_P
	9	CSI_0_CLK_N	10	CSI_1_CLK_N
	11	GND	12	GND
	13	CSI_0_D1_P	14	CSI_1_D1_P
	15	CSI_0_D1_N	16	CSI_1_D1_N
	17	GND	18	GND
	19	CSI_2_D0_P	20	CSI_3_D0_P
	21	CSI_2_D0_N	22	CSI_3_D0_N
	23	GND	24	GND
	25	CSI_2_CLK_P	26	CSI_3_CLK_P
	27	CSI_2_CLK_N	28	CSI_3_CLK_N
	29	GND	30	GND
	31	CSI_2_D1_P	32	CSI_3_D1_P
	33	CSI_2_D1_N	34	CSI_3_D1_N
	35	GND	36	GND
	37	CSI_4_D0_P	38	CSI_6_D0_P
	39	CSI_4_D0_N	40	CSI_6_D0_N
	41	GND	42	GND
	43	CSI_4_CLK_P	44	CSI_6_CLK_P
	45	CSI_4_CLK_N	46	CSI_6_CLK_N
	47	GND	48	GND
	49	CSI_4_D1_P	50	CSI_6_D1_P
	51	CSI_4_D1_N	52	CSI_6_D1_N
	53	GND	54	GND
	55	NC	56	NC
	57	NC	58	NC
	59	CSI_5_D0_P	60	CSI_7_D0_P
	61	CSI_5_D0_N	62	CSI_7_D0_N
	63	GND	64	GND
	65	CSI_5_CLK_P	66	CSI_7_CLK_P
	67	CSI_5_CLK_N	68	CSI_7_CLK_N
	69	GND	70	GND
	71	CSI_5_D1_P	72	CSI_7_D1_P
	73	CSI_5_D1_N	74	CSI_7_D1_N



75	CSI_GP3_CLK	76	NC
77	CSI_GP3_DAT	78	NC
79	GND	80	GND
81	DVDD_CAM_2V8	82	AVDD_CVM_2V8
83	DVDD_CAM_2V8	84	NC
85	CAM_AF_PWDN	86	NC
87	I2C_GP2_CLK	88	CAM1_MCLK03
89	I2C_GP2_DAT	90	GPIO15_CAM1_PWDN
91	CAM0_MCLK02	92	GPIO16_CAM1_RST
93	CAM0_PWDN	94	CAM2_MCLK04
95	CAM0_RST_BUFFER	96	NC
97	NC	98	NC
99	GND	100	GND
101	NC	102	1.8V
103	NC	104	NC
105	I2C_GP4_CLK	106	NC
107	I2C_GP4_DAT	108	3.3V
109	NC	110	3.3V
111	NC	112	NC
113	NC	114	NC
115	GND	116	GND
117	NC	118	3.3V
119	GPIO25_VDD_SYS_EN	120	3.3V
121	GND	122	GND
123	GND	124	GND
125	GND	126	GND
127	GND	128	GND

2.9 M.2 key E interface

Function	M.2			
Marking	P4			
Type	Key E			
Pin define	Pin	Signal	Pin	Signal
	1	GND	2	3.3V
	3	USB2_D+	4	3.3V
	5	USB2_D-	6	LED_1#
	7	GND	8	PCM_CLK/I2S_2_SCK
	9	NC	10	PCM_SYNC/I2S2_WS
	11	NC	12	PCM_OUT/I2S2_SD_OUT
				T






	13	NC	14	PCM_IN/I2S2_SD_IN	
	15	NC	16	LED_2#	
	17	NC	18	GND	
	19	NC	20	UART5_WAKE#	
	21	M2_EN	22	UART5_TXD	
	23	M2_WAKE_AP	24	GND	
	25	GND	26	GND	
	27	GND	28	GND	
	29	GND	30	GND	
	31	GND	32	UART5_RXD	
	33	GND	34	UART5_RTS	
	35	PERP0	36	UART5_CTS	
	37	PERNO	38	VENOOR_DEFINED	
	39	GND	40	NC	
	41	PETP0	42	NC	
	43	PETN0	44	NC	
	45	GND	46	NC	
	47	REFCLKN0	48	NC	
	49	REFCLKP0	50	SUSCLK_32KHZ	
	51	GND	52	PERST0#	
	53	CLKREQ0#	54	W_DISABLE2#	
	55	PEWAKE0#	56	W_DISABLE1#	
	57	GND	58	I2C_GP2_DATA	
	59	RESERVED/PERP1	60	I2C_GP2_CLK	
	61	RESERVED/PERN1	62	ALERT#	
	63	GND	64	NC	
	65	NC	66	NC	
	67	NC	68	NC	
	69	GND	70	NC	
	71	NC	72	3.3V	
	73	NC	74	3.3V	
	75	GND			

2.10 Function Pin


Function	Function pin insertion			
Marking	P17			
Type	2.54mm spacing 2x17Pin double row straight needle insertion			
Pin define	Pin	Signal	Pin	Signal
	1	VDD3V3_OUT	2	VDD3V3_OUT
	3	UART3_TX_DEBUG_CON	4	UART3_RX_DEBUG_CON
	5	UART1_TX_CON	6	UART1_RX_CON
	7	UART2_TX_CON	8	UART2_RX_CON
	9	SPI2_CLK/UART7_TX_CON	10	SPI2_MISO/UART7_RX_CON
	11	SPI2_MOSI/UART7_RTS_CON	12	SPI2_CS0/UART7_CTS_CON
	13	I2C_GP3_CLK_CON	14	I2C_GP3_DAT_CON
	15	GND	16	GND
	17	POWER_BTN_CON	18	RESET_BTN_CON
	19	RECOVERY_BTN_CON	20	RTC_EXT
	21	I2S3_DIN	22	GPIO04
	23	I2S3_DOUT	24	GPIO05
	25	I2S3_FS	26	GPIO20
	27	I2S3_SCLK	28	GPIO21
	29	GND	30	GND
	31	CAN1H	32	CAN1L
33	CAN0H	34	CAN0L	



The serial port level is 3.3V TTL logic level.
 GPIO High level is 3.3V , GPIO direct from AGX Xavier /AGX Xavier industry draw forth
 CAN with a transceiver
 I2C device file is I2C-2
 The mapping file in the /dev directory corresponding to UART1 and UART2 is ttyTHS0, ttyTHS1, and UART3 is the debugging port
 AGX Xavier /AGX Xavier industry mapping Numbers of GPIO04, GPIO05, GPIO20 and GPIO21 in the system are 290, 289, 291 and 288 respectively
 AGX Xavier /AGX Xavier industry industrial mapping Numbers of GPIO04, GPIO05, GPIO20 and GPIO21 in the system are 290, 255, 291 and 288 respectively

2.11 SD Card slot

Function	UFS&SD card slot			
Marking	P3			
Type	Micro-SD			
Pin define	Pin	Signal	Pin	Signal
	1	VSS	2	DIN_C
	3	DIN_T	4	VSS
	5	DOU_T_C	6	DOU_T
	7	VSS	8	REFCLK
	9	VCCQ2	10	C/D(GND)
	11	VSS	12	VCC
	13	DATA1	14	DATA0
	15	CLK	16	CMD
	17	CD/DATA3	18	DATA2
	19	C_DETECT	20	GND
	21	GND	22	GND
	23	GND	24	GND
	25	GND		




2.12 Power port

Function	Power port			
Marking	P18			
Type	D Type of big 4P			
Pin define	Pin	Signal	Pin	Signal
	1	GND	2	GND
	3	VCC	4	VCC

Pin 1 position: as shown in the right figure


Input voltage range: +9v~+20v

Cable connection is strictly prohibited!




2.13 USB TYPE-A interface

Function	USB3.0 interface			
Marking	P9			
Type	Double USB TYPE-A interface			
Pin define	Level		Superstratum	
	Type		USB 3.0	
	Pin	Signal	Pin	Signal
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	GND
	5	SSRX-	6	SSRX+
	7	GND	8	SSTX-
	9	SSTX+		
	Level		Substratum	
	Type		USB 3.0	
	Pin	Signal	Pin	Signal
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	GND
	5	SSRX-	6	SSRX+
7	GND	8	SSTX-	
9	SSTX+			




2.14 Network interface

Function	Ethernet connector			
Marking	P7/P8			
Type	RJ45 network interface			
Pin define	Pin	Signal	Pin	Signal
	1	TP0+	2	TP0-
	3	TP1+	4	TP2+
	5	TP2-	6	TP1-
	7	TP3+	8	TP3-

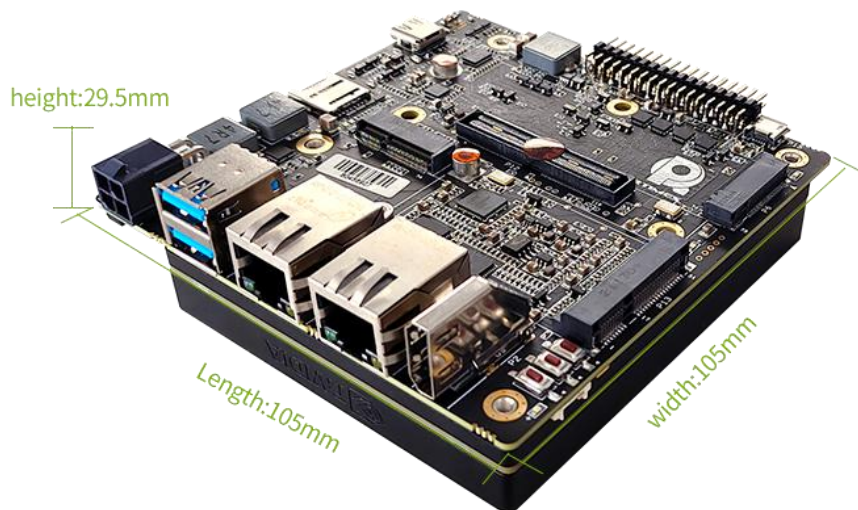


2.15 USB Micro interface

Function	USB2.0 connector			
Marking	P15			
Type	Micro-B			
Pin define	Pin		Signal	
	1	VBUS	2	USB 2.0 D-
	3	USB 2.0 D+	4	NC
	5	GND		



3 Product size



4 Hardware update history

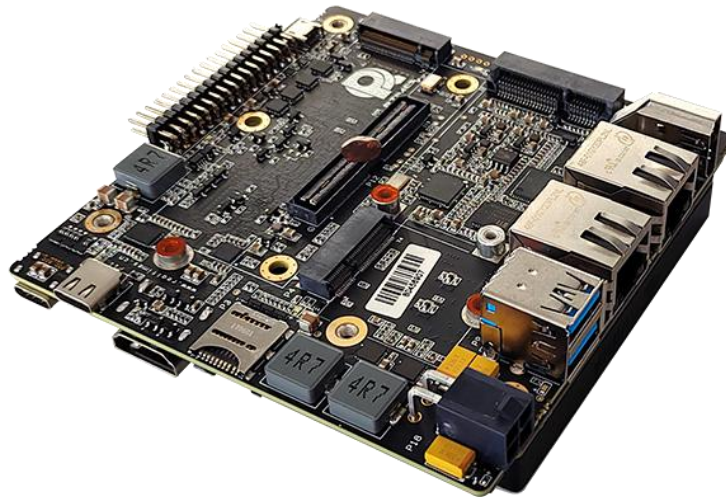
RTSO-1001 Board hardware update history

Versions	Update Description
V1.0	Initial version
V1.1	Hardware circuit optimization

Software version supporting instructions

1 Installation and use

1.1 picture of products



1.2 Usage

- a) Ensure all external system voltages are turned off
- b) Install the AGX Xavier /AGX Xavier industry core module on the 699-PIN SO-DImm connector. Pay attention to the pairs between the connectors during the installation install the fixing screw at the same time.
- c) Install necessary external cables. (e.g., the display cable connected to the HDMI display, the power input cable that powers the system,USB cable linking keyboard and mouse...)
- d) Connect the power cord to the power supply.
- e) RTSO-1001 adopts automatic power-on design, turns on the power and the system starts to work.
- f) For the system without protective enclosure, please avoid moving the whole system after the system is powered on. It is strictly prohibited to use body touch road board and its electronic components.

1.3 Recovery Mode

The Jetson AGX Xavier /AGX Xavier industry core module can work in normal mode and Recovery mode, under which the file series can be carried out system update, kernel update, Boot Loader update, BCT update and other operations.

The steps to enter the Recovery mode are as follows:

- a) Turn off the system power supply.
- b) Use USB cable to connect RTSO-1001's USB port (P10) with Jetson to develop the host USB port.
- c) Press the RECOVERY button without releasing it to power the system. The power supply should be maintained for more than 3 seconds, and then the RECOVERY button will be released.
- d) The system enters the Recovery mode, and subsequent operations can be carried out at this point.

2 L4T (Linux for Tegra Abbreviation “L4T”)

RTSO-1001 boards work on systems that are burned using the official original NVIDIA Linux For Tegra (L4T). HDMI, Gigabit Ethernet, USB2.0, serial port, GPIO, SD card, I2C bus, fan interface, can be supported. RTSO-1001 onboard interface full support, need to load the supporting driver patch.

NVIDIA LT4 package can be downloaded from the following link:

<https://developer.nvidia.com/embedded/linux-tegra>

RTSO-1001 Driver patch support package download:

<https://www.realtimesai.com>

For the installation of the operating system and jetpack, please refer to the AGX Xavier system instruction manual (Ruitai Cloud Network Disk/Help Documentation/Jetsonx System Burning and Backup Directory).

RTSO-1001 board level patch support package download jump link:

<https://www.realtimes.cn/cn/software.html>

3 Jetpack

Nvidia jetpack sdk is the most comprehensive solution for building AI applications. It includes software libraries and apis, examples, developer tools and documentation for the latest and previous versions of Jetson products.

3.1 Jetpack Component summary

This section briefly introduces each component of JetPack. For more detailed information about these components, please refer to JetPack's online documentation.

OS Image

JetPack includes a reference file system derived from Ubuntu. (Development kit system, no need to install)

Libraries and APIs

JetPack library and API include:

- TensorRT and cuDNN for high-performance deep learning applications
- CUDA for multi-domain GPU accelerated applications
- NVIDIA Container Runtime for containerized GPU accelerated applications
- Multimedia API package for camera application and sensor driver development
- VisionWorks, OpenCV and VPI for visual computing applications
- Sample application

3.2 How to install Jetpack

Overview of process steps

Installing JetPack to your Jetson device requires you to perform the following steps:

1. Download and install the NVIDIA SDK Manager on the Linux host.
2. Connect your jetson device to the Linux host (Micro USB or network (same network segment)).
3. Test your device can connect via ssh.
4. Use SDK Manager to select and install the required components.

Download and install the NVIDIA SDK Manager on the Linux host.

You must have a Linux host with internet access to run SDK Manager and refresh the developer kit. The supported host operating systems are:

Ubuntu Linux x64 Version 18.04 or 16.04

Download and install NVIDIA SDK Manager.

sdkmanager Installation package: **sdkmanager-[version].[build#].deb**

The current version is: **sdkmanager_1.2.0**

sdkmanager install

\$ sudo apt install ./sdkmanager-[version].[build#].deb

Connect your jetson device to the Linux host

Prepare your Jetson device for the following settings. (If the equipment system is not initialized, the system user needs to initialize after power-on)

- Connect the monitor, keyboard and mouse to the Jetson Feiyun smart box device (please refer to the interface description above).
- Use Micro USB cable to connect Linux host and Jetson Feiyun Smart Box (or network (same network segment))
- During the setup process, SDK Manager will provide Internet connection for your jetson Feiyun Smart Box via USB or network connection.
- Connect the supplied power adapter to the DC jack of the Feiyun Smart Box, and plug the AC interface into an AC power outlet.

Test that your device can connect via ssh.

If connected via Micro USB, enter lsusb under the Linux host terminal to see the nvidia crop

The device can be accessed through ping or ssh commands

\$ ping 192.168.55.1

or

\$ ssh <jetson_user>@192.168.55.1

If connected via a network, check whether the device ip address is in the same network segment as the Linux host on the Feiyun Smart Box, and the Feiyun Smart Box device can be accessed through the ping or ssh command.

```
$ ping <jetson_ip>
```

or

```
$ ssh <jetson_user>@<jetson_device_ip>
```

Use SDK Manager to select and install the required components

NVIDIA SDK Manager supports installing software to Jetson core (Flying Cloud Smart Box). For complete instructions, please refer to Chapter 5 of "[Xavier System Programming Manual](#)".

3.3 Developer tools

JetPack includes the following development tools. Some are used directly on the Jetson system, and some run on a Linux host connected to the Jetson system.

• Application development and debugging tools

- NSight Eclipse version for GPU-accelerated application development: runs on a Linux host. All Jetson products are supported.
- CUDA-GDB for application debugging: Runs on a Jetson system or a Linux host. All Jetson products are supported.
- CUDA-MEMCHECK to debug application memory errors: run on Jetson systems. All Jetson products are supported.

• Application analysis and optimization tools

- NSight Systems for application multi-core CPU profiling: runs on a Linux host. Helps you improve application performance by identifying slow parts of your code. All Jetson products are supported.
- NVIDIA® Nsight™ compute kernel profiler: an interactive profiling tool for CUDA applications. It provides detailed performance metrics and API debugging through the user interface and command line tools.
- NSight Graphics for Graphics Application Debugging and Profiling: A consolegrade tool for debugging and optimizing OpenGL and OpenGL ES programs. Running on a Linux host. All Jetson products are supported.

3.4 Documentation

Documents related to developers using JetPack include:

- [JetPack Documentation](#)
- [VisionWorks Documentation](#)
- [Nsight Eclipse Edition Documentation](#)
- [CUDA-GDB Documentation](#)
- [CUDA-MEMCHECK Documentation](#)
- [TensorRT Documentation](#)
- [cuDNN Documentation](#)
- [CUDA Toolkit](#)
- [NVIDIA Container Runtime](#)
- [OpenCV Documentation](#)
- [Jetson Linux Multimedia API Reference](#)
- [Nsight Systems](#)
- [nvprof](#)
- [Visual Profiler](#)
- [Nsight Graphics](#)
- [Nsight Compute CLI](#)
- [VPI-Vision Programming Interface](#)

Terms of Warranty

Important note

Each embedded product provided by Realtimes Technology is free from any defects in material and process,fully in line with the specifications officially issued by the original factory.

Realtimes Technology warranty covers the original products,If the parts configured by the dealer are out of order, please consult with the dealer to solve the problem. All the baseplate and core modules provided by Ruitai New Era (Beijing) Technology Co., Ltd. are guaranteed for 3 years, while the other peripherals are guaranteed for 1 year (life-long maintenance service is provided if the warranty period is beyond the warranty period).The warranty period starts from the date of delivery, for the products repaired within the warranty period, the repair parts shall be extended for 12 months.Unless notified by Realtimes Technology, the date of your original invoice shall be the date of shipment.

How do I get warranty services

If the product does not work properly, Please contact Realtimes Technology or dealer for warranty service, please show invoice when product warranty(this is the proof for you getting warranty service).

Warranty solution

When you ask for warranty service, please follow Realtimes Technology warranty process,You will need to receive your first diagnosis from a technical engineer by phone or by email,at that time,we need you to cooperate with us to fill in all the questions on the RMA form provided by us. Once we accurately determine the cause of the fault and the location of the damage ,we will provide the charge list for the out of warranty products,which needs your confirmation.Realtimes Technology keep the right to repair or replace the products. If the product is replaced or repaired, the replaced faulty product or the repaired and replaced faulty parts will be returned to Realtimes Technology.

For products under warranty,the customer shall bear the freight when the product is returned to the manufacturer,Realtimes Technology will bear the ship cost of the products after maintenance.

The following conditions are not covered by the warranty terms

- a) Improper installation, improper use, misuse and abuse of products(Overloading, for example).
- b) Improper maintenance and storage (Such as fire, explosion, etc) or natural disasters (such as lightning stroke,earthquake,typhoon,etc)
- c) Personal unauthorized changing the product(such as changing circuit characteristics, mechanical characteristics, software characteristics,Conformal coating).
- d) Other failures which are clearly due to misuse(such as overvoltage,polarity reversal, the pin bent or broken,the wrong connection,drop damage,transportation damage,damage due to over operating temperature and so on).
- e) The logo and part number on the product have been deleted or removed.
- f) The product is out of warranty.

Special concerns



If the same fault multiple occurrence for the products,in order to find out the reason causing the problem,we will request the users to provide the specific documents or information of peripheral equipment,such as monitor,I/O boards,cables,power supply, diagram and structure of the system,etc.If such documents or information are not available,we have the right to refuse to perform the warranty, the repairments will be charged accordingly.

Rev.C 6/2020

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