

S2 Embedded Artificial Intelligence Computer

User Manual

V1.1 2020.5



S2 is a fully-featured embedded platform for AI computing. It provides both high processing capabilities and high energy efficiency. S2 carries one of the most powerful mobile computing core modules, NVIDIA Jetson TX2 and it brings artificial intelligence to edge devices. In addition, a variety of computer vision algorithm acceleration SDK are provided on S2 platform.

S2 embedded AI computer can be equipped with Foxtech products such as XLink-30 30km or VDC 7km/15km Datalink and Videolink& DA16S+ RC & EH314 4K Mini Camera or EH640 30x Optical zoom Dual-sensor Camera (Ethernet output) to achieve long-range HD video transmission applied in environmental monitoring, fire detection, road patrol, vehicle detection, etc.

If you have any issue using the product , please get support from support 1@foxtechfpv.com.

Revisions

Revision	Date	Release Notes
V1.0	2019/02/01	Initial release
V1.1	2019/3/21	Add Bluetooth
V1.2	2019/5/10	Change system infomation

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1. Introduction

1.1. S2

S2 is a fully-featured embedded platform for AI computing. It provides both high processing capabilities and high energy efficiency. S2 brings artificial intelligence to edge devices. S2 carries one of the most powerful mobile computing modules, NVIDIA Jetson TX2. In addition, a variety of computer vision algorithm acceleration SDK are provided on S2 platform.

1.2. Maintenance

- Avoid hot plugging.
- Do not unplug S2 before shutting down the system.
- Do not use cables or connectors other than described in this manual.
- Do not use S2 near strong magnetic fields.
- Backup your data before transportation or S2 is idle.
- Recommend to transport S2 in its original packaging.

1.3. Included in the Box

- S2 × 1
- I/O Cable Assemblies × 2
- Power supply with AC cord × 1
- WiFi Antenna × 2
- Quick Start × 1
- Test certificate × 1

1.4. Specification

1.4.1. Processor

Processor Module	NVIDIA Jetson TX2
CPU	HMP Dual Denver2/2MB L2 + ARM Cortex-A57/2MB L2
GPU	256-core Pascal GPU
Memory	8GB 128-Bit LPDDR4
Storage	32GB eMMC 5.1

1.4.2. Interface

Category	Function	Quantity	Notes
Connection	Ethernet	2 × RJ45, Gigabit	
	WiFi	1	
	Bluetooth	1 × Bluetooth 4.1	
Display	HDMI	1 × HDMI 2.0 TYPE A	
USB	USB	2 × USB 3.0 TYPE A 1 × Micro USB	
I/O	GPIO	2	
	CAN	3	
	UART	2 × TTL 1 × RS485	
	Rest KEY	1	
	Switch KEY	1	Boot mode switch

1.4.3. Power Supply

Power Requirements	Power Type	DC
	Power Input Voltage	12V
	Power Adapter	Input: AC 100-240V Output: DC 12V 2A
Power Consumption	Typical	15W

1.4.4. Mechanical

Mechanical	Dimensions (W × H × D)	100mm × 56mm × 62mm
	Weight	338g

1.4.5. Environment

Environment	Operating Temperature	-20°C-70°C
	Storage Temperature	-25°C-80°C
	Relative Humidity	10%-90% non-condensing

1.5. Interfaces

1.5.1. Front Panel I/O Interfaces

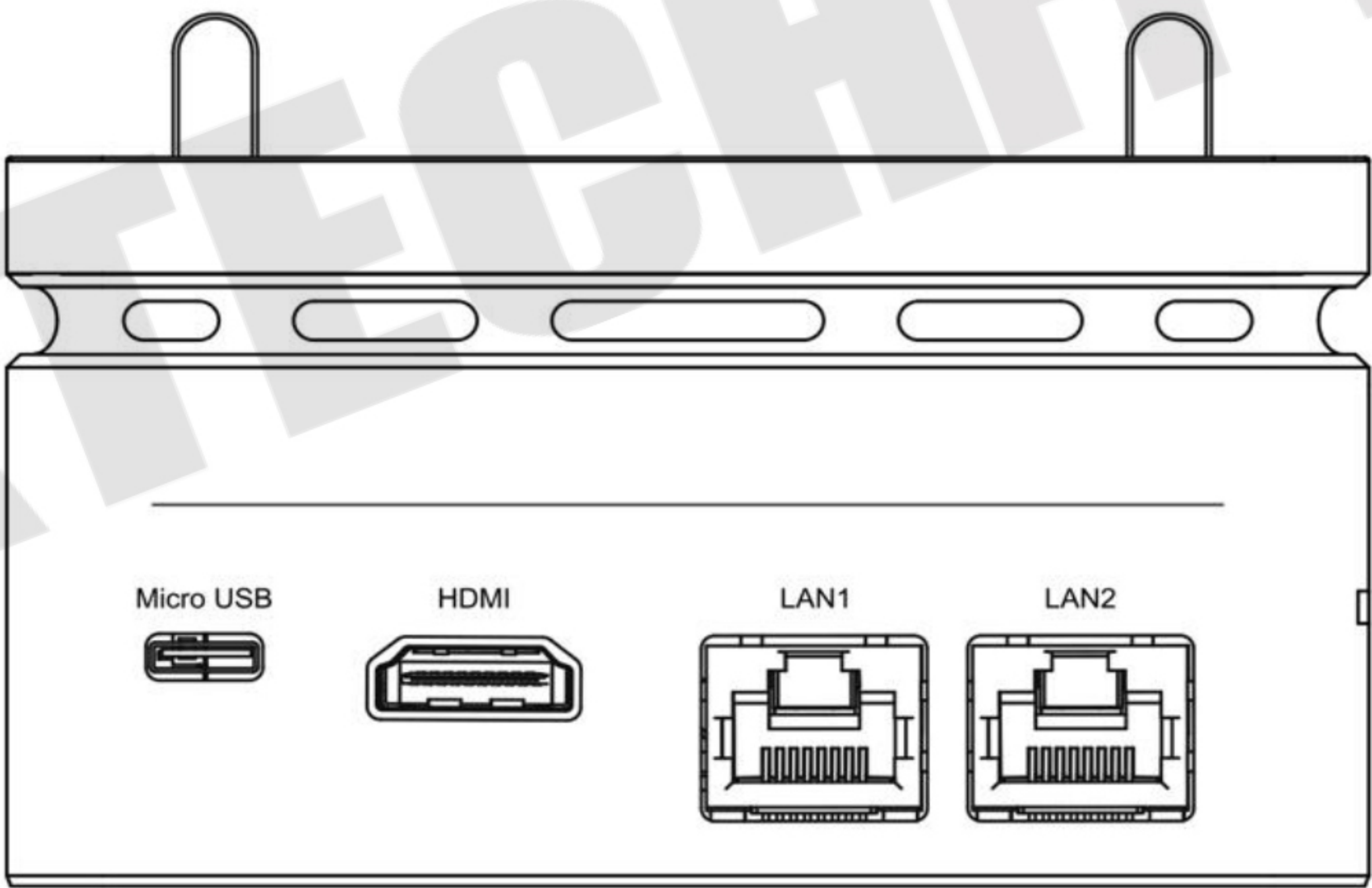


Figure 1.1 S2 Front View

Interface	Name	Description
Micro USB	Micro USB	Supports OTG
HDMI	HDMI 2.0 Port	HDMI 2.0
LAN_1	Gigabit ethernet	RJ45
LAN_2	Gigabit ethernet	RJ45

1.5.2. Left Panel I/O Interface

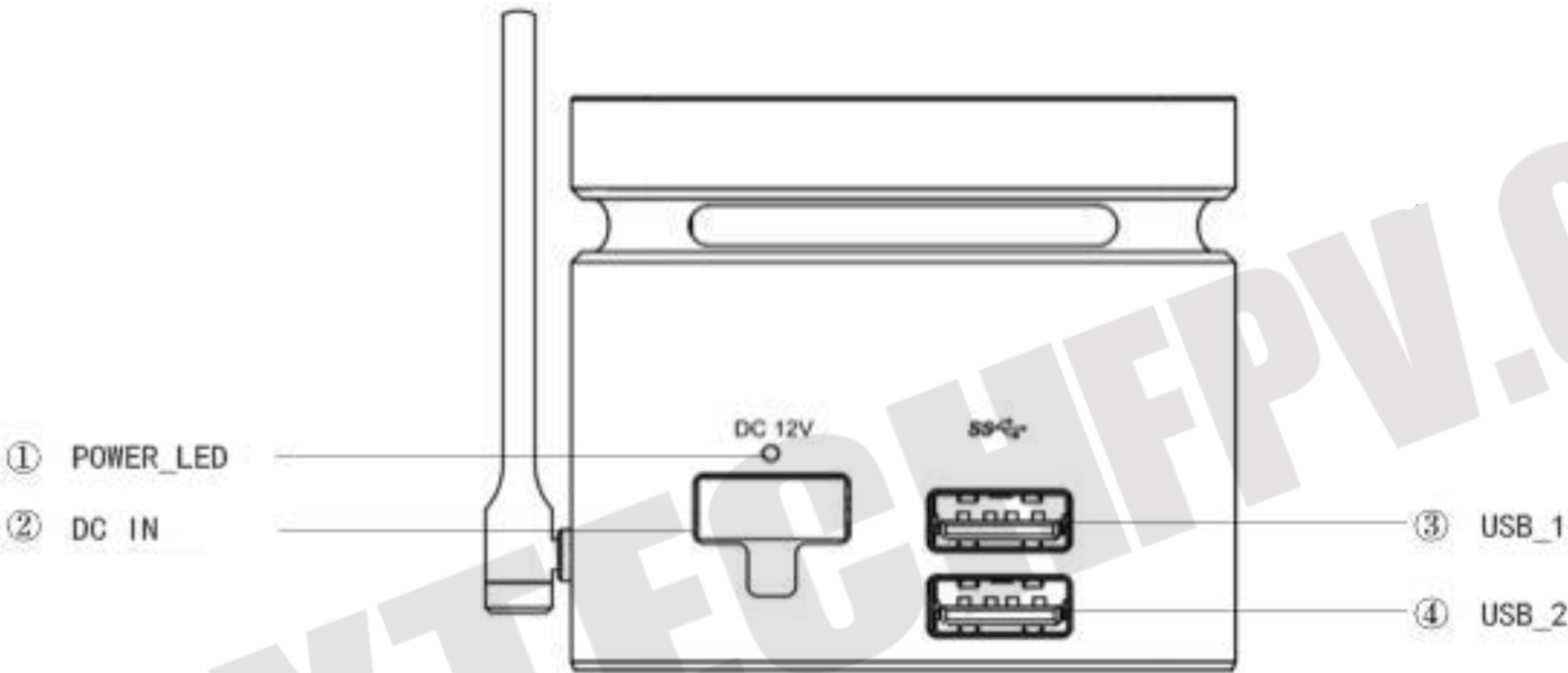


Figure 1.2 S2 Left View

Interface	Name	Description
POWER_LED	Device status indicator	Power on: solid white System flashing/ Error: solid red
DC IN	Power interface	Input: 12V 2A
USB_1	USB3.0 port	
USB_2*	USB3.0 port	

*Note: For full speed mode of USB_2, use `$ ifconfig eth1 down`

1.5.3. Right Panel I/O Interfaces

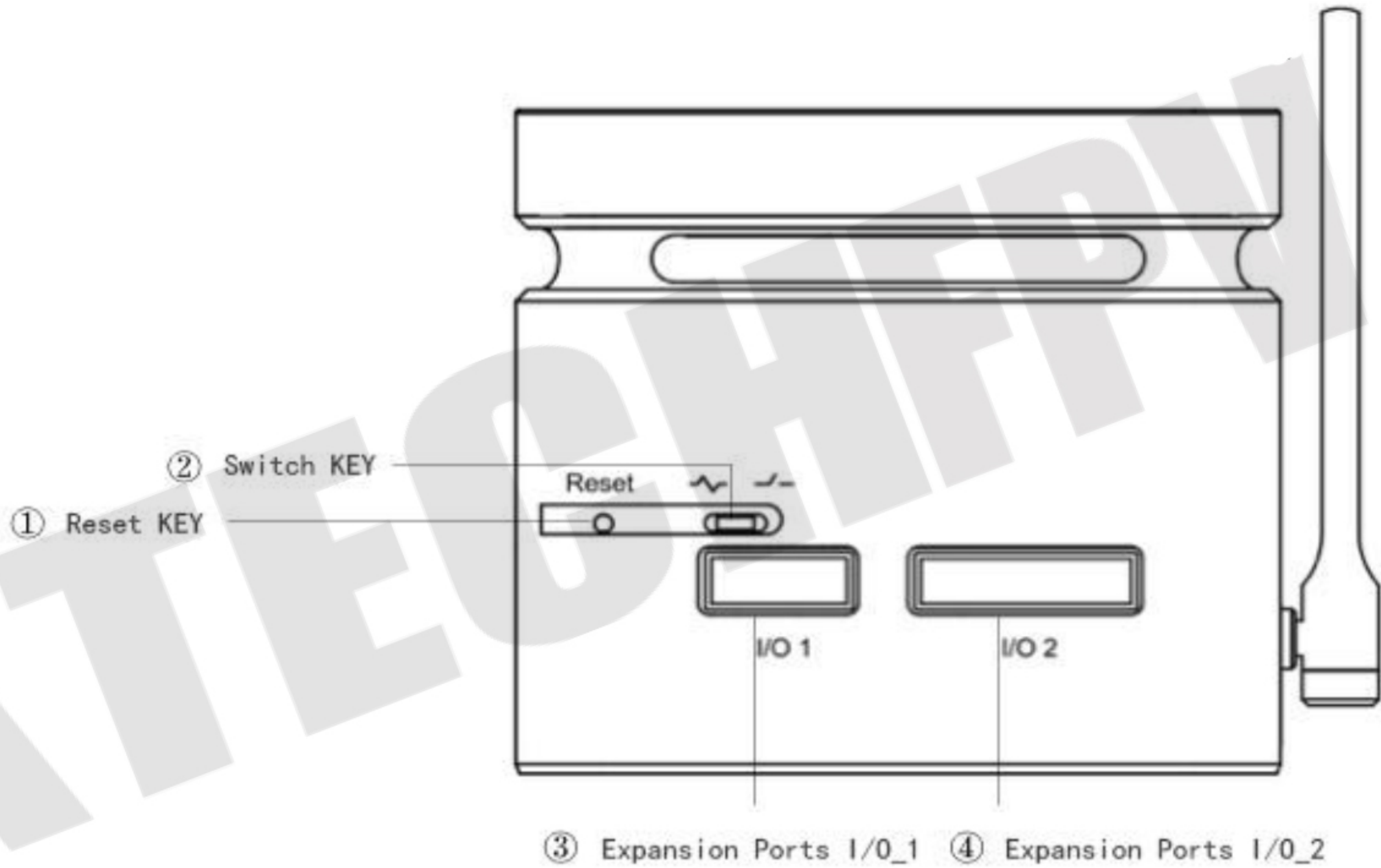


Figure 1.3 S2 Right View

Interfaces	Name	Description
Reset KEY	Reset key	Reset system
Switch KEY	Switch key	Boot mode switch: ~~~~ : Auto boot ---- : Manual boot
I/O_1	I/O Expansion Port 1	1 × CAN 1 × TTL 1 × RS485
I/O_2	I/O Expansion Port 2	2 × CAN 1 × TTL/Debug, 2 × GPIO 1 × POWER_ONKEY

		1× FORCE_RECOVERY 1× BUTTON_VOL_DOWN
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1.5.4. Rear Panel I/O Interface

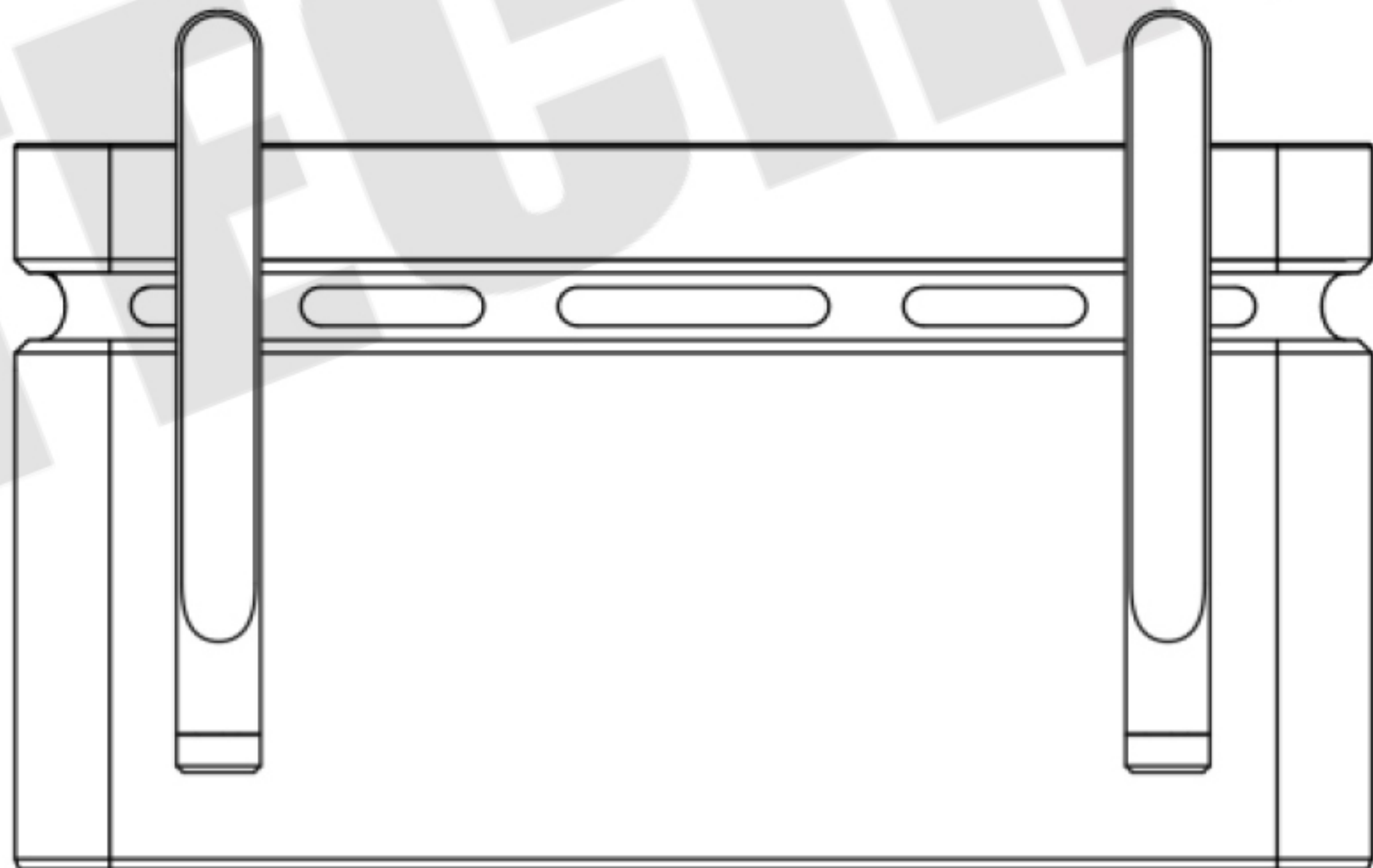


Figure 1.4 S2 Rear View

Interface	Name	Description
SMA	2.4G/5G Antenna connector	Connect to 2.4G/5G WiFi

1.5.5. I/O Expansion Port Pin Definitions

There are two I/O expansion ports at the right panel of S2, as I/O_1 and I/O_2:

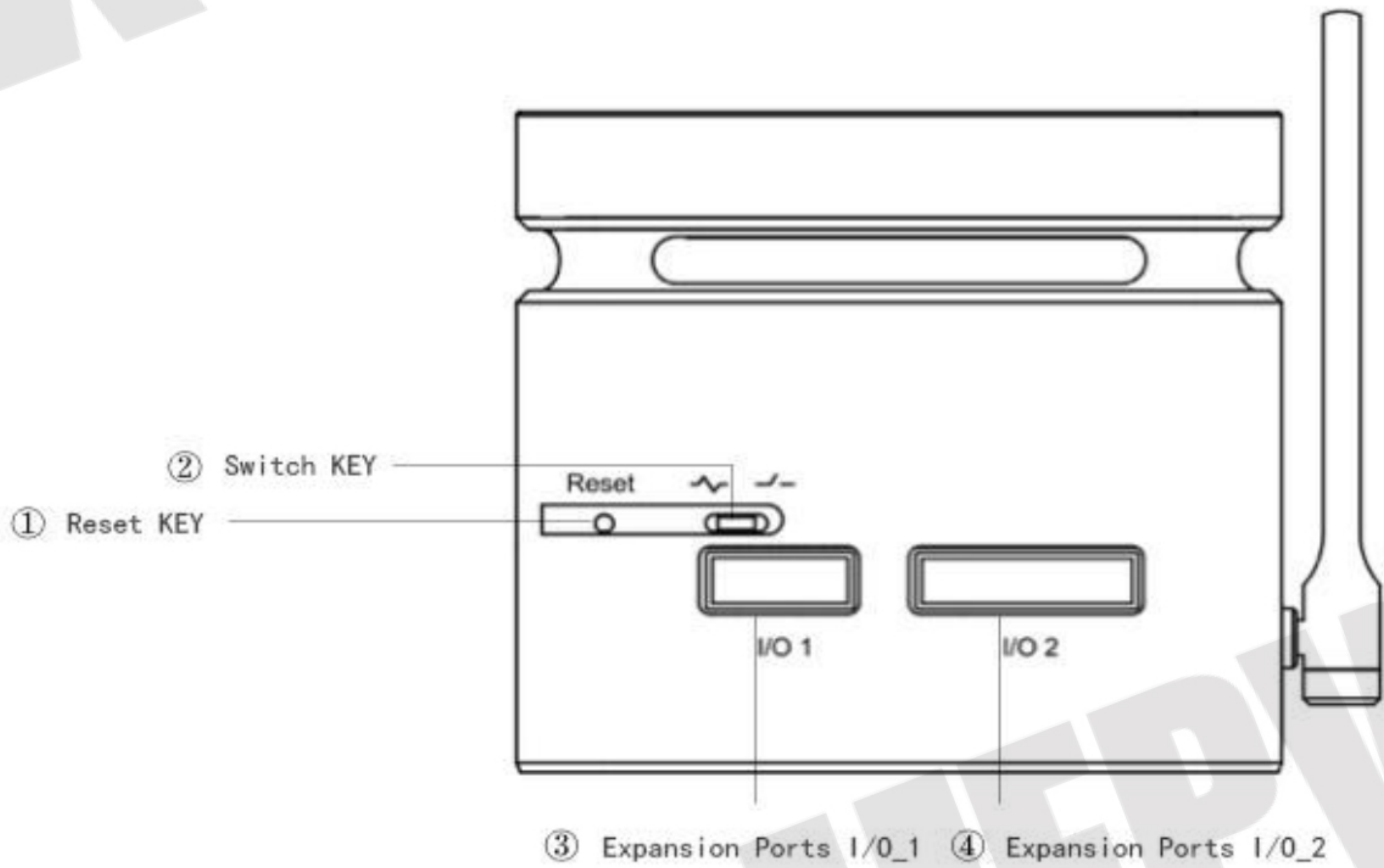


Figure 1.5 I/O Expansion Ports

1.5.6. I/O_1 Pin Assignments

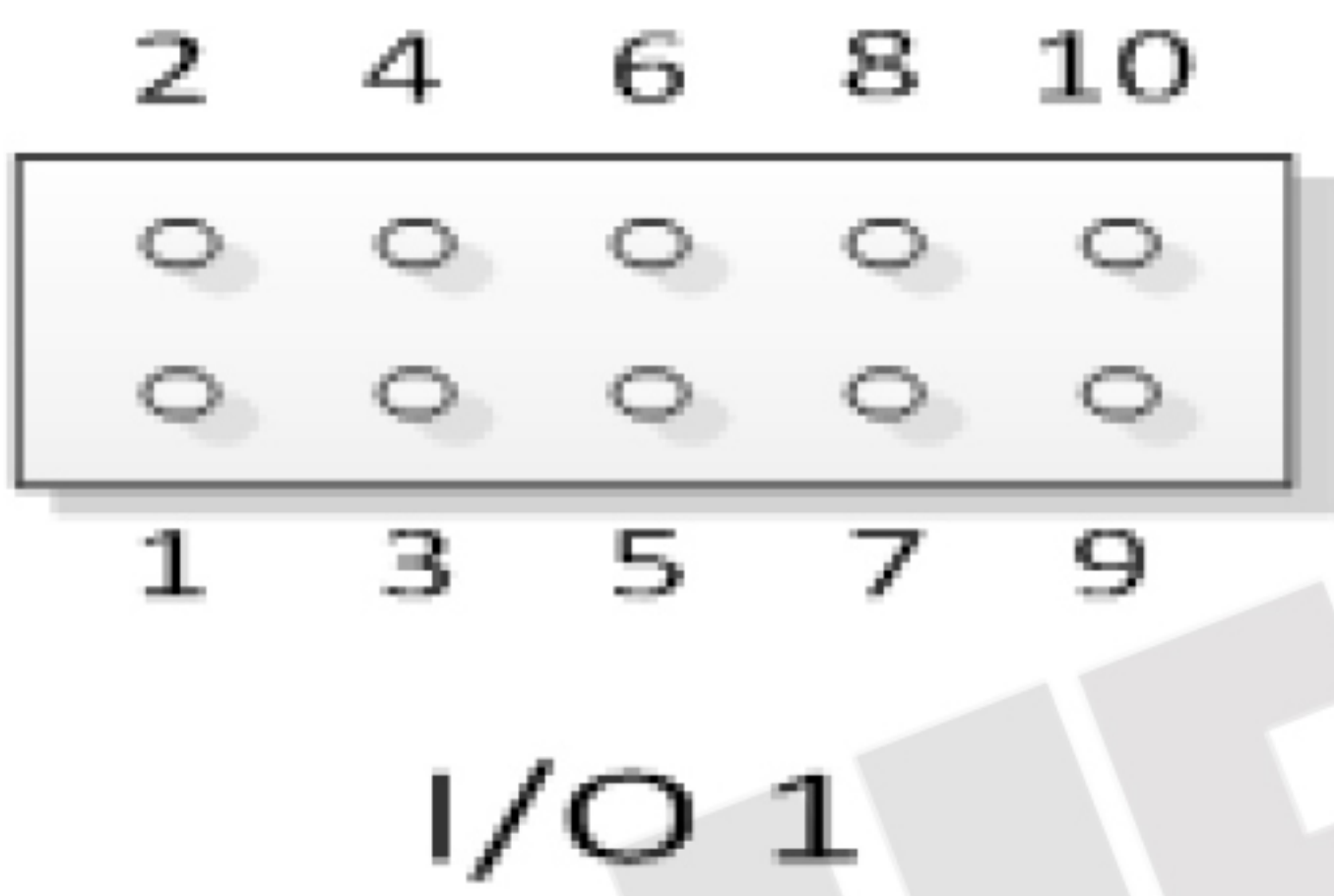


Figure 1.6 Pin Numbers for I/O_1

Port Name	Pin	Definition	Description
MCU_UART	1_1	MCU_UART1_TX	TTL receive
	1_2	MCU_UART1_RX	TTL transmit
	1_3	VDD_3V3_MCU	3.3V
	1_4	GND	Ground
MCU_SWD	1_5	MCU_SWD_I/O	SWDIO
	1_6	MCU_SWD_CLK	SWD Clock signal
MCU_CAN1	1_7	CAN1_L	CAN1 low
	1_8	CAN1_H	CAN1 high
MCU_RS485	1_9	RS485_A	MCU_RS485_A
	1_10	RS485_B	MCU_RS485_B

1.5.7. Expansion Port I/O_2 Pin Assignments

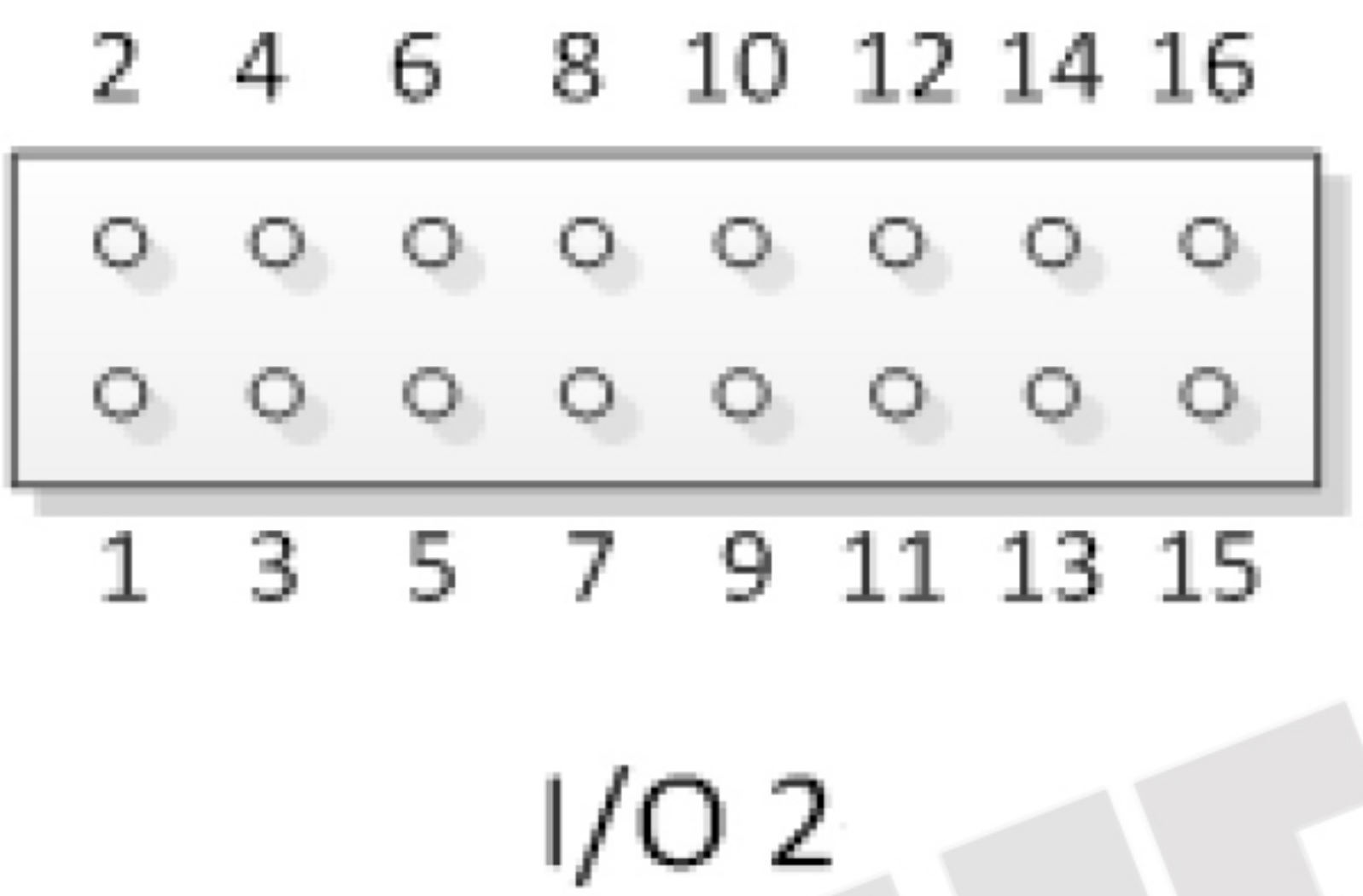


Figure 1.7 Pin Numbers for Expansion Port I/O_2

Port Name	Pin	Definition	Description
POWER_ONKEY	2_1	POWER_BTN	Manual power on
	2_2	GND	Ground

Self-inspection port	2_3	BUTTON_VOL_DOWN	Connect pin 3 and pin 4 for self-inspection
	2_4	GND	
Recovery port	2_5	FORCE_RECOVERY_L	Connect pin 5 and pin 6 to enter recovery mode
	2_6	GND	
CAN 0	2_7	TX1_CAN0_L	CAN 0 low
	2_8	TX1_CAN0_H	CAN 0 high
CAN 1	2_9	TX1_CAN1_L	CAN 1 low
	2_10	TX1_CAN1_H	CAN 1 high
UART1	2_11	DGB_UART1_TXD_3V3	TTL transmit: 3.3V
	2_12	DGB_UART1_RXD_3V3	TTL receive: 3.3V
	2_13	GND	Ground
GPIO11/ GPIO12	2_14	GND	Ground
	2_15	GPIO11_3V3	GPIO11: 3.3V
	2_16	GPIO12_3V3	GPIO12: 3.3V

5. I/O Cable

Provides two I/O cables: I/O_1 cable and I/O_2 cable. Shown as below:



Figure 1.8 I/O 1 Cable

Number	Port	Details
I/O1_1	MCU_UART MCU_SWD	1X6 Pin Connector
I/O1_2	MCU_CAN1	1X3 Pin Connector
I/O1_3	MCU_RS485	1x2 Pin Connector



Figure 1.9 I/O 2 Cable

Number	Port	Details
I/O2_1	POWER_BTN	Button
I/O2_2	BUTTON_VOL_DOWN FORCE_RECOVERY_L	1X4 Pin Connector
I/O2_3	CAN 0	1X3 Pin Connector
I/O2_4	CAN 1	1X3 Pin Connector
I/O2_5	UART1	1X3 Pin Connector
I/O2_6	GPIO11/ GPIO12	1X3 Pin Connector

1.7. Dimensions

W x H x D: 100mm x 56mm x 62mm

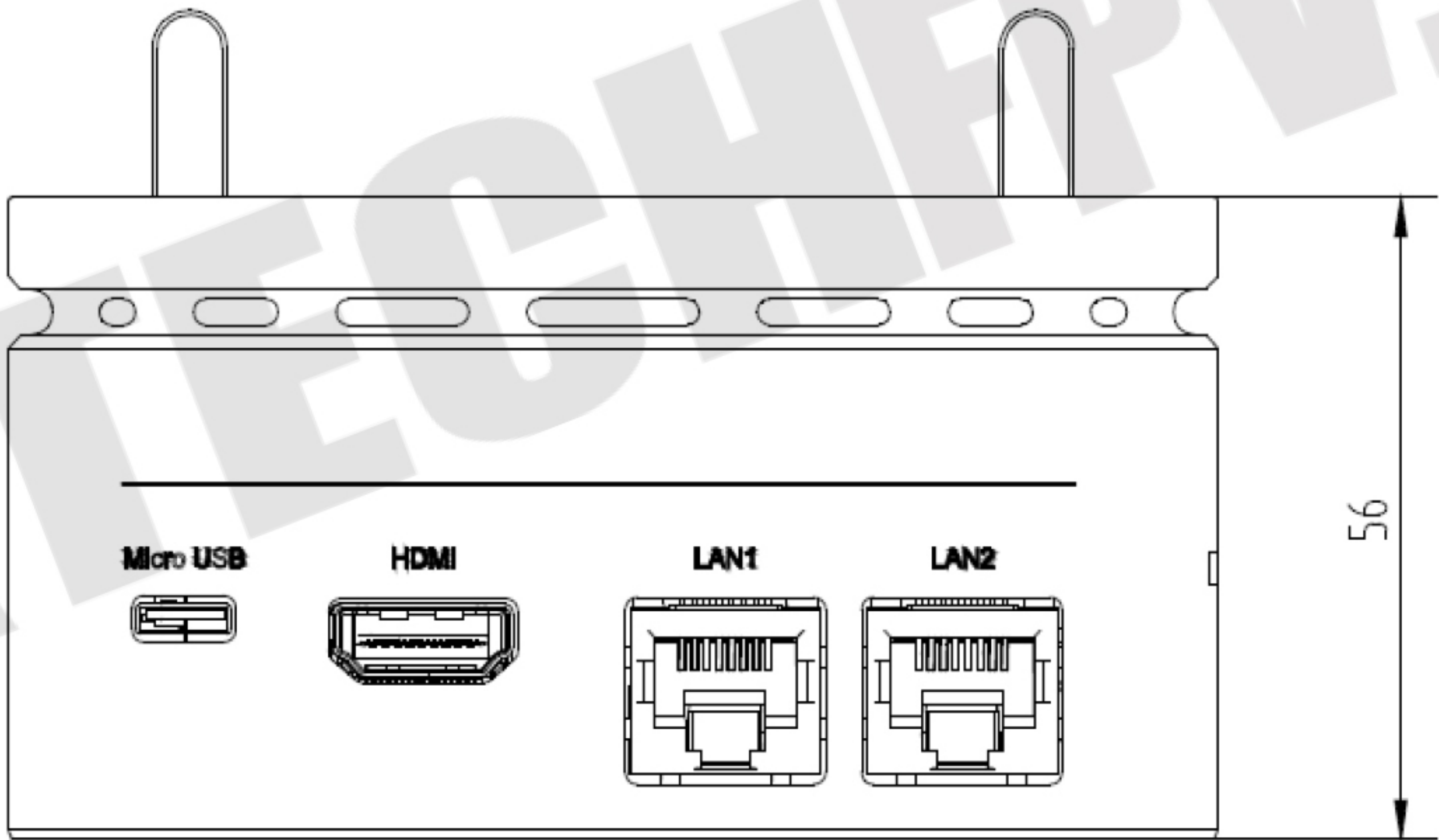


Figure 1.10 S2 Dimension_1

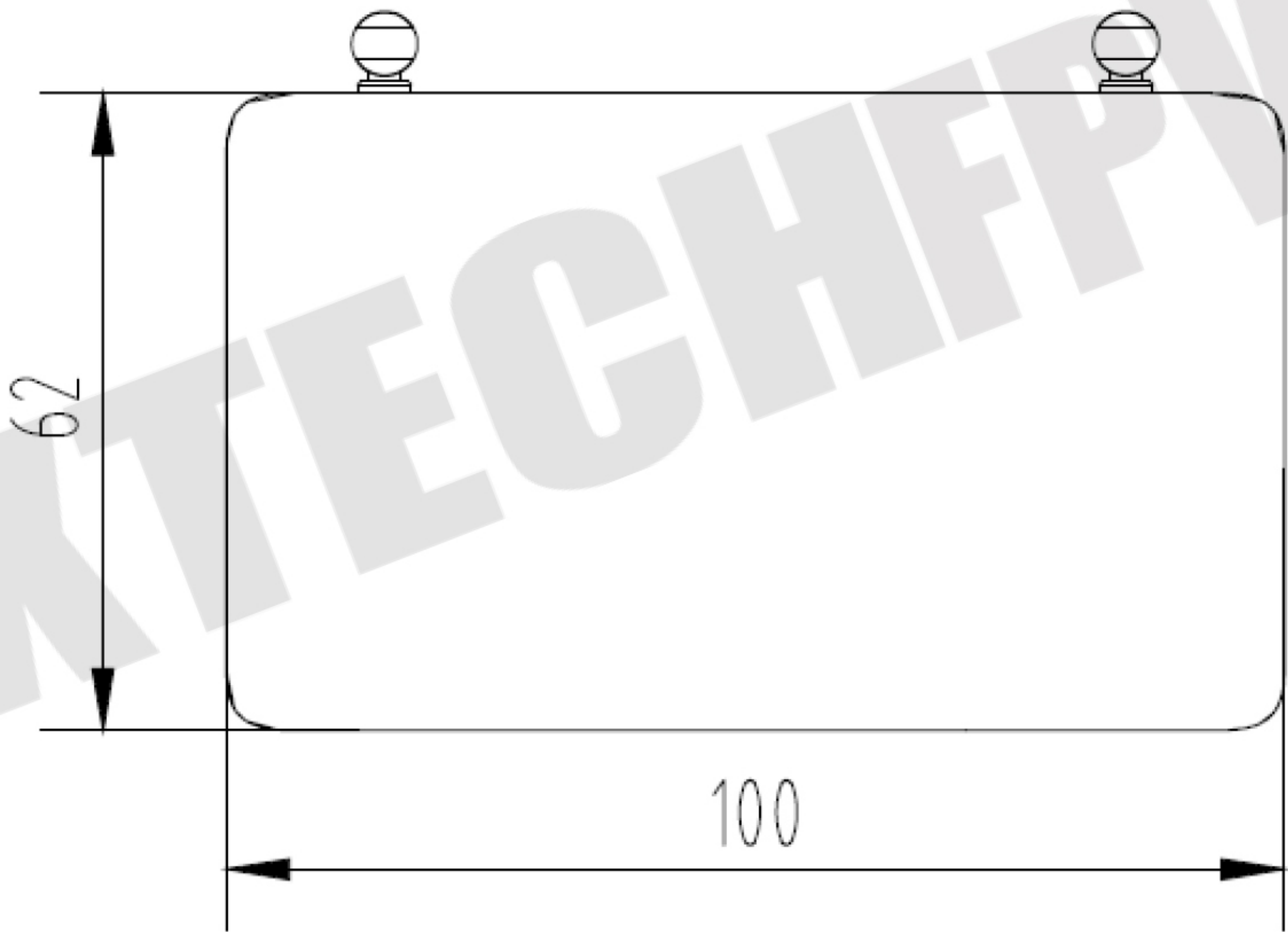


Figure 1.11 S2 Dimension_2

1.8. Software

S2 has Ubuntu system. Default Username: nvidia. Default Password: nvidia

1.9. Warranty

1.10.1. Warranty period: One year from the date of delivery.

1.10.2. Warranty content: S2 warrants the product manufactured by us to be free from defects in material and workmanship during warranty period. Please contact support1@foxtechfpv.com return material authorization (RMA) prior to returning any items for repair or exchange. The product must be returned in its original packaging to prevent damage during shipping. Before returning any product for repair, it is recommended that you back up the data and delete any confidential or personal information.

1.10.3. Warranty waiver: S2 assumes no liability under the following conditions:

- a) Any malfunction, damage or compatibility problems caused by the use of software or hardware that not supported by S2
- b) Third-party software or virus, or data loss that may occur during developing
- c) Any modification, repair or service by any party other than foxtech authorized representative
- d) Normal wear and tire, consumable parts
- e) Any other external factors such as liquids, fires, natural disaster or any other act of force majeure (include but not limited to lightning, war or earthquake)

For out-of-warranty repair, you will be charged according to the cost of replacement materials, service time and freight.

2. Instructions

2.1. Power on, power off and reset

Power on: Connect an external HDMI display to S2's HDMI port.

Connect a USB keyboard and mouse.

Connect AC adapter to S2 power socket. Plug AC adapter into an appropriately rated electrical outlet.

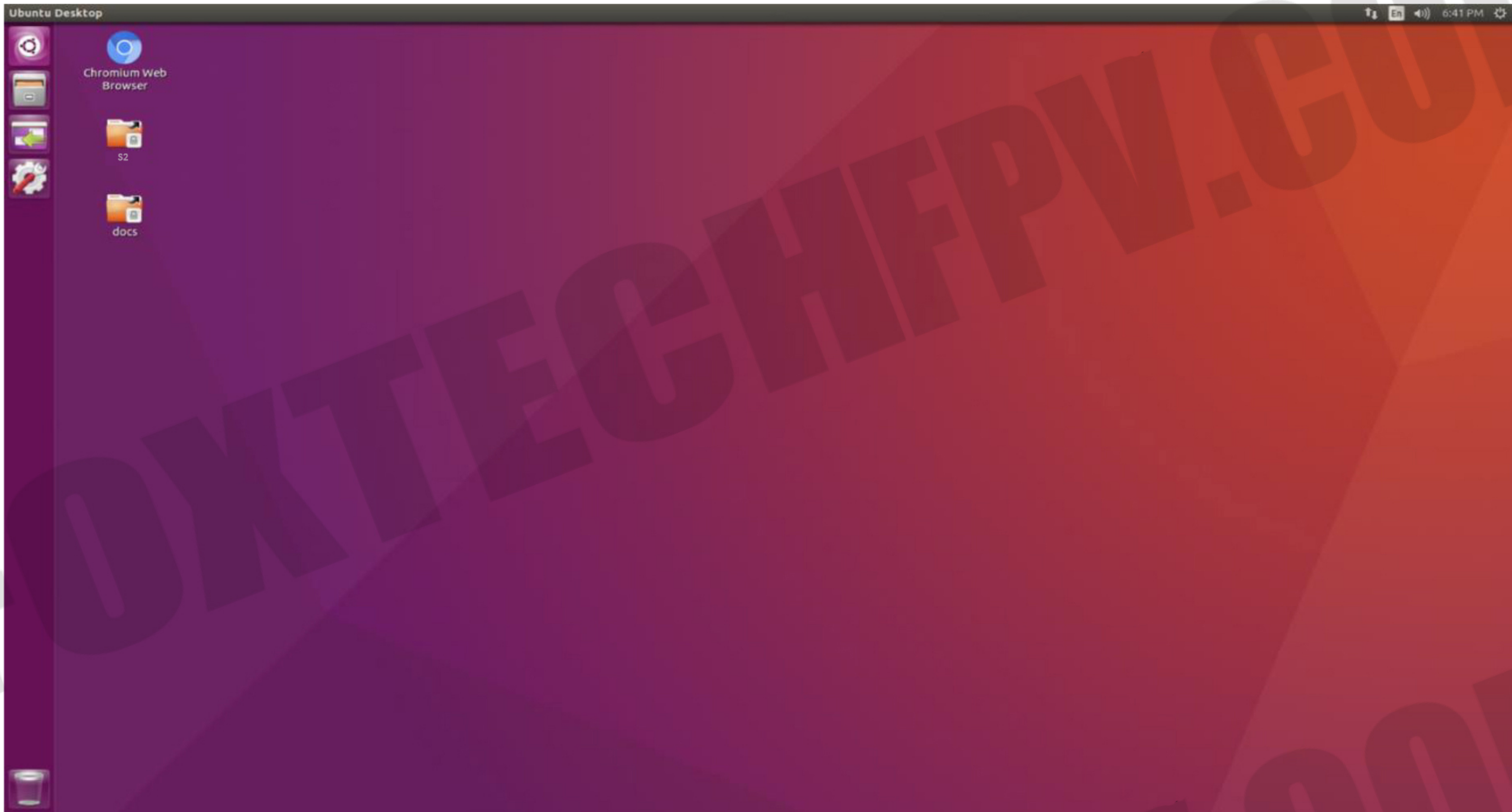


Figure 2.1 Startup Desktop

Power off: `$sudo poweroff`
Reset: `$ sudo reboot` for soft reset or press RESET button for hard reset.

2.2. Interface Instructions

2.2.1. GPIO Expansion Cable: I/O2_6

Port Name	Pin Number	GPIO	GPIO Export Value
GPIO	2_15	GPIO11	389
	2_16	GPIO12	332

Table 2.1 Pin Numbers for GPIO

```
# switch to root user
$ sudo su -
# set GPIO11 for input:
$ echo 389 > /sys/class/gpio/export
$ echo "in" > /sys/class/gpio/gpio389/direction
# read GPIO11 value
# set GPIO11 for output
$ echo 389 > /sys/class/gpio/export
$ echo "out" > /sys/class/gpio/gpio389/direction
# set GPIO11 to high
$ echo 1 > /sys/class/gpio/gpio389/vlaue
# set GPIO11 to low
```



```
$ echo 0 > /sys/class/gpio/gpio389/value
```

To save configuration, write above commands to file ‘/etc/rc.local’.

2.2.2. UART Expansion Cable I/O2_5

Pin Number	UART Port	Device Node
1_1~1_4	MCU_UART	ttyTHS1
1_9~1_10	MCU_RS485	NA
2_11~2_13	UART1	ttyS0

Table 2.2 Pin Numbers for UART

Open device node in /dev/. Then use stty command to set parameters. (See stty command manual for details)

```
#Open and set UART1 parameters
$ sudo stty -F /dev/ ttyS0 speed 115200 cs8 -parenb -cstopb -echo
#send data from UART1
$ sudo echo "miivii tty debug" > /dev/ ttyS0
#receive data from UART1
$ sudo cat /dev/ ttyS0
```

2.2.3. CAN

Please check cansend.c and candump.c from <https://github.com/linux-can/can-utils> for instructions.

Test command:

```
$ sudo modprobe can
$ sudo modprobe can_raw
$ sudo modprobe mttcan
$ sudo ip link set can0 type can bitrate 1000000 dbitrate 1000000 berr-reporting on fd on
$ sudo ip link set up can0
$ sudo cansend can0 123#abcdabcd
$ sudo candump can0
$ sudo ip -details -statistics link show can0
$ sudo ifconfig can0 down
```

2.3. WiFi Connection

Connect an external HDMI display to S2’s HDMI port. Click the network icon in upper-right conner of the desktop. Find the name of your WiFi network and click on it. Enter your password and click ‘Connect’.



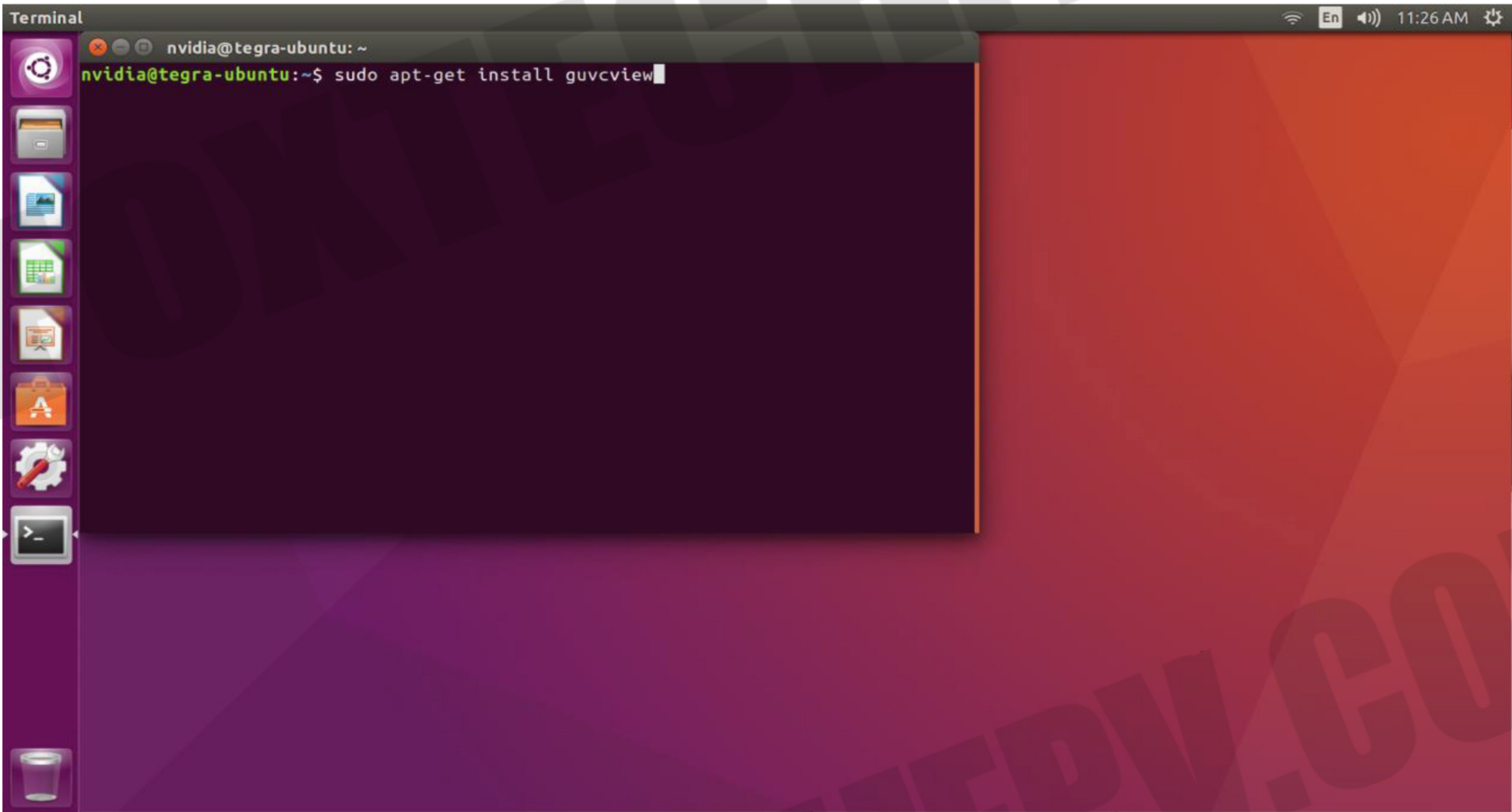
Figure 2.10 WiFi Connection

2.4. USB Camera

S2 provides 2 USB 3.0 ports for USB camera.

First connect the camera with S2 via USB port, then enter the following command to install guvcview:

```
# install guvcview
$ sudo apt-get install guvcview
```



```
# run
$ guvcview
```

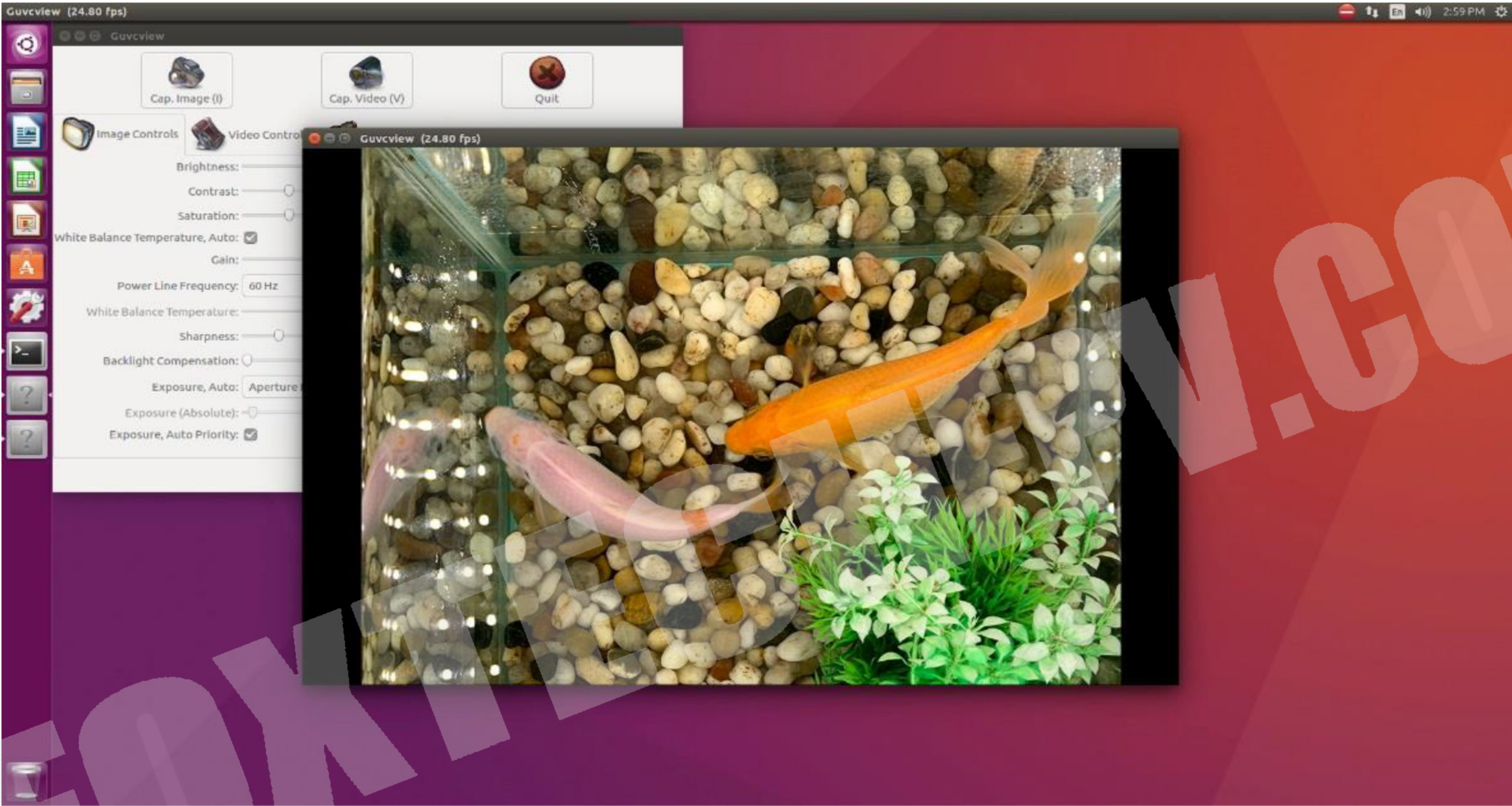



Figure 2.3 Picture captured by USB camera