

VT-SBC35-3562

Single Board Computer



User Manual

Version: 1.2

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Revision History

No.	Version	Description	Date
1	V1.0	First release	Jul. 14, 2023
2	V1.1	Updated pinout description of GPIO	Dec. 27, 2023
3	V1.2	Added the power consumption readings when running different systems	Aug. 15, 2024

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Foreword

Thank you for purchasing VT-SBC35-3562 single board computer (“the Board” or “the Product”). This manual intends to provide guidance and assistance necessary on setting up, operating or maintaining the Product. Please read this manual and make sure you understand the functionality of the Product before putting it into use.

Intended Users

This manual is intended for:

- Embedded software developer
- Custom development software engineer
- Other technically qualified personnel

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While all information contained herein has been carefully checked to assure its accuracy in technical details and typography, Vantron does not assume any responsibility resulting from any error or features of this manual, nor from improper uses of this manual or the software.

It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without notice.

Technical Support and Assistance

Should you have any question about the Product that is not covered in this manual, contact your sales representative for solution. Please include the following information in your question:

- Product name and PO number;
- Complete description of the problem;
- Error message you received, if any.

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Symbology

This manual uses the following signs to prompt users to pay special attention to relevant information.







	Caution for latent damage to system or harm to personnel
	Attention to important information or regulations

General Safety Instructions

The Product is supposed be installed by knowledgeable, skilled persons familiar with local and/or international electrical codes and regulations. For your safety and prevention of damage to the Product, please read and observe carefully the following safety instructions prior to installation and operation. Keep this manual well for future reference.

- Do not disassemble or otherwise modify the Product. Such action may cause heat generation, ignition, electronic shock, or other damages including human injury, and may void your warranty.
- Keep the Product away from heat source, such as heater, heat dissipater, or engine casing.
- Do not insert foreign materials into any opening of the Product as it may cause the Product to malfunction or burn out.
- To ensure proper functioning and prevent overheating of the Product, do not cover or block the ventilation holes of the Product.
- Follow the installation instructions with the installation tools provided or recommended.
- The use or placement of the operation tools shall comply with the code of practice of such tools to avoid short circuit of the Product.
- Cut off the power before inspection of the Product to avoid human injury or product damage.

Precautions for Power Cables and Accessories

-  Use proper power source only. Make sure the supply voltage falls within the specified range.
-  Place the cables properly at places without extrusion hazards.
-  There is a coin cell battery for powering the RTC. Therefore, please avoid short circuit of the battery during transportation or operation at high temperatures.
-  Cleaning instructions:
 - Power off before cleaning the Product
 - Do not use spray detergent
 - Clean with a damp cloth
 - Do not try to clean exposed electronic components unless with a dust collector
-  Power off and contact Vantron technical support engineer in case of the following faults:
 - The Product is damaged
 - The temperature is excessively high
 - Fault is still not solved after troubleshooting according to this manual
-  Do not use in combustible and explosive environment:
 - Keep away from combustible and explosive environment
 - Keep away from all energized circuits
 - Unauthorized removal of the enclosure from the device is not allowed
 - Do not change components unless the power cable is unplugged
 - In some cases, the device may still have residual voltage even if the power cable is unplugged. Therefore, it is a must to remove and fully discharge the device before replacement of the components.

CHAPTER 1 INTRODUCTION

1.1 Product Overview

VT-SBC35-3562 single board computer comes in a 3.5-inch form factor that is easy to be integrated. The board is powered by the high-performance, low-power quad-core Rockchip RK3562 processor, which integrates an Arm Mali-G52 GPU for enhanced 2D/3D graphic acceleration, supporting OpenGL ES1.1/2.0/3.2, OpenCL 2.0, and Vulkan 1.1. It offers video codec support including H.264 decoding at 1080p@60fps, H.265 decoding at 4K@30fps, and H.264 encoding at 1080p@60fps. The built-in NPU offers up to 1 TOPS processing performance, with support for mainstream deep-learning frameworks such as TensorFlow, TF-lite, Pytorch, Caffe, MXNet. The 13M @30fps ISP with HDR capabilities is for capturing high-resolution images and smooth video footage for optimal interactive performance.

Connectivity options include both Megabit and Gigabit Ethernet jacks, a combo Wi-Fi 6 and Bluetooth 5.4 chipset, and optional 4G/5G network for IoT applications. In addition, it provides rich peripherals for diverse applications such as commercial displays, live streaming devices, smart education controllers, smart home hubs, industry-specific tablets, and medical appliances.

1.2 Product Feature

- Rockchip RK3562, Quad-core ARM Cortex-A53 processor
- Default 2GB memory + 32GB storage, expansion support
- H.265 decoding at 4K @30fps, H.264 codec at 1080p @60fps
- Up to 4096 x 2304 @30fps MIPI DSI video output
- Dual Ethernet, Wi-Fi 6, BT 5.4, optional 4G/5G connectivity
- Dual MIPI CSI interfaces, supporting 13MP @30fps for camera ISP
- Rich interfaces for flexible expansion (GPIO, RS232/RS485/RS422, USB, TP)
- Up to 1 TOPS processing performance, with support for mainstream AI frameworks
- 3.5-inch form factor for easy integration

1.3 Terminology/Acronym

Please refer to the table below for acronyms or terminologies used in this document, especially for those included in the pinout description of the device.

Terminology/Acronym	Description
NC	No connection
VCC	Voltage common collector
GND	Ground
P (+)	Positive difference signal
N (-)	Negative difference signal
SCL	Serial clock
SDA	Serial data
I	Input
O	Output
I/O	Input/output
P	Power/ground
RX	Receive data
TX	Transmit data
PCIe	Peripheral component interconnect express
MDI	Media dependent interface
INT	Interrupt
RST	Reset
MISO	Master in slave out
MOSI	Master out slave in

1.5 Specifications

VT-SBC35-3562				
System	CPU	Rockchip RK3562, Quad-core ARM Cortex-A53 processor, up to 2.0GHz		
	GPU	Arm Mali-G52		
	NPU	Up to 1 TOPS		
	Video CODEC	H.265 decoding at 4K @30fps, H.264 codec at 1080p @60fps		
	Memory	2GB 32-bit LPDDR4x		
	Storage	32GB eMMC 5.1	Optional: SSD expansion (M.2 Key B)	
Communication	Ethernet	1 x RJ45, 10/100/1000Mbps	1 x RJ45, 10/100Mbps	
	Wi-Fi and BT	802.11 a/b/g/n/ac/ax + BT 5.4		
	Cellular	Optional: 4G/5G (M.2 Key B)		
Media	Display	1 x MIPI DSI, up to 4096 x 2304 @30fps / 1920 x 1080 @60fps		
	(Alternate)	1 x HDMI 1.4, up to 1920 x 1200 @60fps		
	Audio	1 x A-Mic	1 x 1W Speaker connector	
		1 x 3.5mm 4-pole combo audio jack		
	Camera	2 x MIPI CSI, ISP: 13M @30fps		
Touch	1 x TP connector			
I/Os	Serial	2 x RS232	2 x RS232/485/422	
	USB	2 x USB 2.0 Type-A	2 x USB 2.0 connector* 1 x USB 2.0 Type-C (OTG, debug...)	
	GPIO header	8 x GPIO		
	Fan	1 x Fan connector (12V)		
	UART	1 x Debug UART (3.3V, Optional)		
	SIM	1 x Nano SIM slot		
	RTC	Supported		
	WDT	Supported		

VT-SBC35-3562			
Expansion	M.2 Key B	1 x M.2 Key B (2242, PCIe 2.0 for SSD or 3050, USB 2.0 for 4G / PCIe 2.0 for 5G)	
System Control	Key	4 x Key (Volume +/-, RST, PWR)	1 x MaskROM key
	LED indicator	1 x Power indicator	1 x Connector (PWM, RST, Home, DL)
Power	Input	12V 3A DC	
		1 x Power jack	1 x Power connector (Optional)
Software	Operating system	Android 13, Debian 11	
Mechanical	Dimensions	146mm x 102mm	
Environmental	Temperature	Operating: 0°C~+60°C	Storage: -20°C~+80°C
		(Optional: -40°C~+85°C)	(Optional: -55°C~+85°C)
	Humidity	20%-80% RH (Non-condensing)	
	Certification	FCC Part 15, Class B	ESD: ±8KV (Air), ±4KV (Contact)

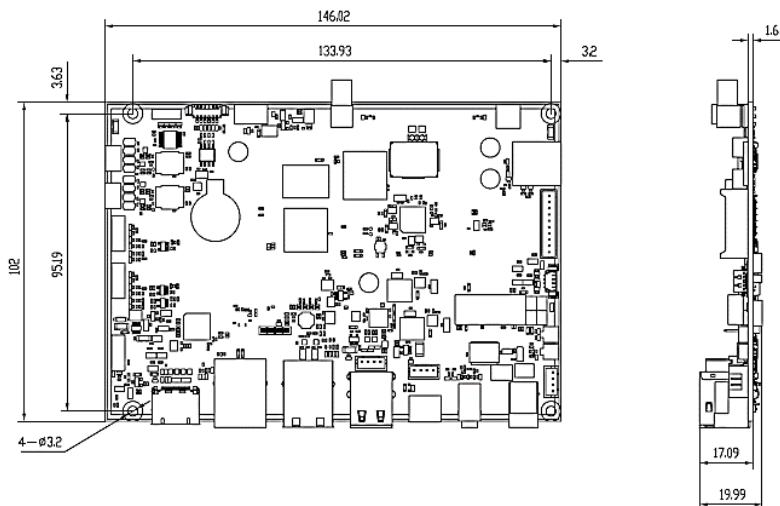
* USB 2.0_1 is not intended for simultaneous use with the USB 2.0 Type-A port located at the top of the stack configuration.

1.6 Operating system

VT-SBC35-3562 supports Debian 11 and Android 13 operating systems.

1.7 Mechanical Dimensions

- 146.02mm x 102mm x 19.99mm



1.8 Power Supply and Consumption

VT-SBC35-3562 works with 12V/3A DC power supply.

The power consumption of the board is briefed below.

Consumption when running the Android system:

Board Status	Test Data	Consumption
Power on	Voltage: 12V Current: 0.3A (Avg.)/0.4A (max.)	3.6W/4.8W
Idle	Voltage: 12V Current: 0.17A	2W
Full load	Voltage: 12V Current: 0.38A	4.56W

Consumption when running the Debian system:

Board Status	Test Data	Consumption
Power on	Voltage: 12V Current: 0.25A (Avg.)/0.3A (max.)	3W/3.6W
Idle	Voltage: 12V Current: 0.18A	2.16W
Full load	Voltage: 12V Current: 0.26A	3.12W

It should be pointed out that the power consumption is largely determined by the RAM, storage capacity, peripherals, and other configurations of the board.

The testing for the power-on consumption involves the average and maximum currents during the power-on process of the board, without running any programs.

The testing for the idle consumption records the average current when the board is idle with the HDMI port connected after power up.

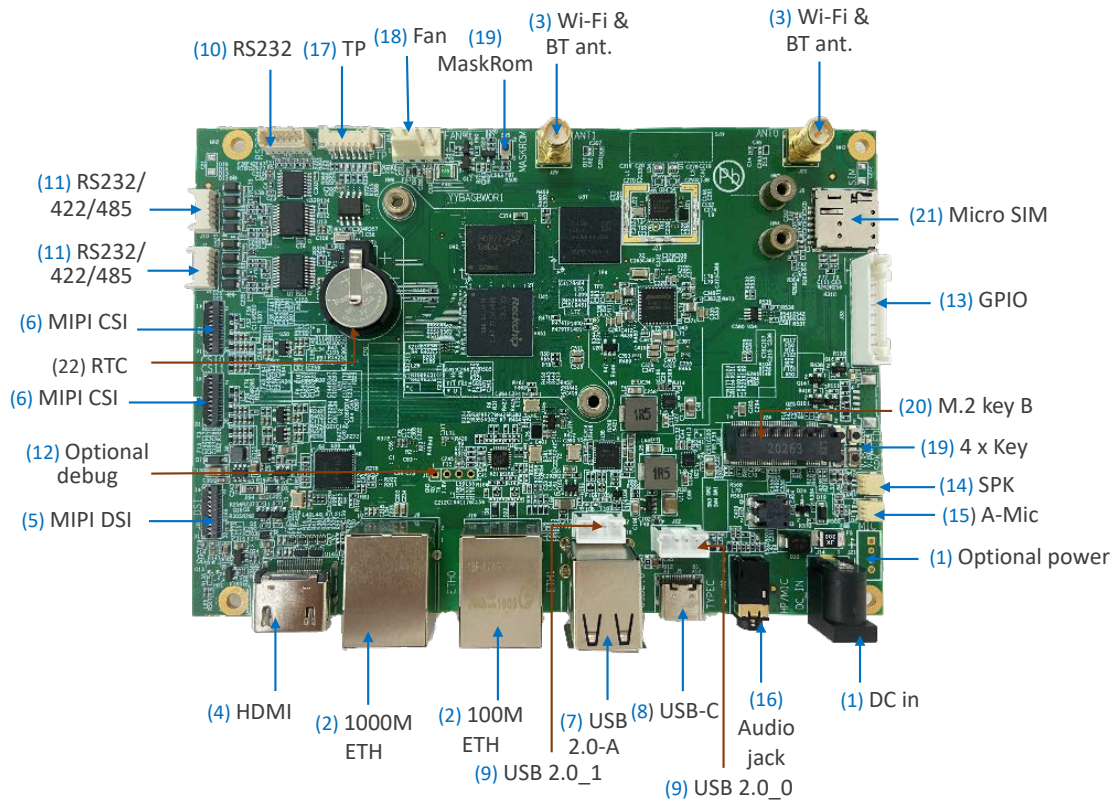
The testing for the full load consumption records the current with 100% CPU usage.

1.9 Environmental Conditions

VT-SBC35-3562 works at a temperature ranging from 0°C to +60°C, with an option for -40°C to +85°C and is designed to be stored at a temperature ranging from -20°C to +80°C, with an option for -55°C~+85°C. It is designed to work and be stored at a relative humidity between 20% and 80% for non-condensing purpose.

CHAPTER 2 HARDWARE DESCRIPTION

2.1 Product Layout



▶ There is a key connector at the back of the Board, offering Power, Rest, Home, and Download pins. The I/Os will be described in detail in 2.4 Connectors and Jumpers following the sequencing numbers provided here.

2.2 Memory and Storage

2.2.1 LPDDR4 RAM

VT-SBC35-3562 is equipped with a 2GB 32-bit LPDDR4x RAM by default.

2.2.2 eMMC Flash

VT-SBC35-3562 provides an eMMC 5.1 flash, offering a default capacity of 32GB, with option for SSD expansion by an M.2 Key B. It is used as the default boot and storage device.

2.2.3 EEPROM

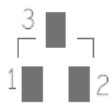
VT-SBC35-3562 provides a 2Kb EEPROM to store hardware configuration information.

2.3 Identification of Pin 1

Unless otherwise stated, pin 1 of a connector is seated on a square pad that is different from the round pads used for other pins. Sometimes, pin 1 is next to a trigonal mark on the board. When there are two rows of pins on a connector, the row with pin 1 is composed of odd numbers and the other is composed of even numbers.



Usually, there will be numbers or marks next to the pins of a connector on the board to indicate the pinouts.



2.4 Connectors and Jumpers

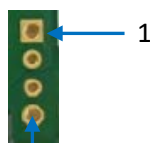
This section is going to brief the connectors/jumpers on the Board with corresponsive pinout description.

2.4.1 J14/J21 Power input (1)

VT-SBC35-3562 provides a 2.0mm power jack to supply 12V 3A power for the Board. There is also an unpopulated 4-pin header next to the power jack reserved for customers to select for power input.



J14 Power jack



J21 Unpopulated power header

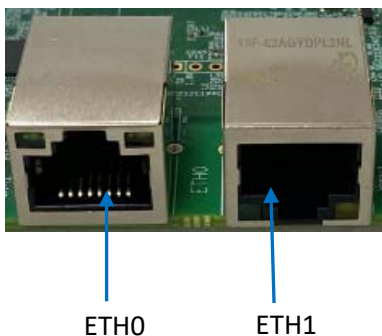
Pinout description of the unpopulated 4-pin power header:

Pin	Name	Type	Description
1	+VDC	P	DC-IN POWER +
2	+VDC	P	DC-IN POWER +
3	-VDC	P	DC-IN POWER -
4	-VDC	P	DC-IN POWER -

2.4.2 J9/J19 Ethernet port (2)

VT-SBC35-3562 offers two RJ45 Ethernet jacks with two LEDs, green for activity indication and yellow for link indication. Eth0 supports a transmission rate of 10/100/1000Mbps, while ETH1 supports 10/100Mbps.

The two Ethernet jacks are designated as WAN ports, intended for connecting to a router or switch to establish Internet access. They support automatic failover in case of a network failure.



2.4.3 J20/J29 Wi-Fi and Bluetooth (3)

VT-SBC35-3562 offers a combo Wi-Fi and Bluetooth module, combining Wi-Fi 802.11 a/b/g/n/ac/ax and Bluetooth 5.4. There are two antenna connectors (RPSMA-K) next to the module for connecting the Wi-Fi & Bluetooth antennas.

2.4.4 J25 HDMI (4)

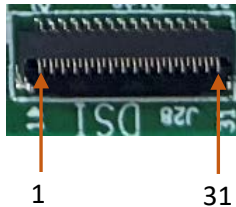
VT-SBC35-3562 offers an HDMI 1.4 Type-A interface for up to 1920 x 1200 @60fps image output. The pinout description of the interface is in line with the pin assignment of a standard HDMI Type-A interface.

This port is designed not to be used simultaneously with the MIPI DSI, and you are advised to make a choice between the two before shipment because the software images might be different.

2.4.5 J28 MIPI DSI (5)

VT-SBC35-3562 offers a 4-lane MIPI DSI interface for connecting high-definition displays, with a resolution up to 4096 x 2304 @30fps / 1920 x 1080 @60fps.

Specification: 1 x 31, 0.3mm, 1.0mm (H), RA, WDT, SMT, RoHS



Pinout description:

Pin	Name	Type	Description
1	LED+	P	Power supply for backlight
2	LED+	P	Power supply for backlight
3	LED+	P	Power supply for backlight
4	NC		
5	LED-	P	Power supply for backlight
6	LED-	P	Power supply for backlight
7	LED-	P	Power supply for backlight
8	NC		
9	GND	P	Ground
10	GND	P	Ground
11	MIPI_D2P	O	MIPI DSI differential lane 2 +
12	MIPI_D2N	O	MIPI DSI differential lane 2 -
13	GND	P	Ground
14	MIPI_D1P	O	MIPI DSI differential lane 1 +
15	MIPI_D1N	O	MIPI DSI differential lane 1 -
16	GND	P	Ground
17	MIPI_CLK+	O	MIPI DSI differential clock lane +
18	MIPI_CLK-	O	MIPI DSI differential clock lane -
19	GND	P	Ground
20	MIPI_D0P	O	MIPI DSI differential lane 0 +
21	MIPI_D0N	O	MIPI DSI differential lane 0 -
22	GND	P	Ground

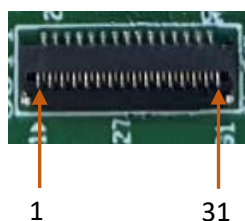
Pin	Name	Type	Description
23	MIPI_D3P	O	MIPI DSI differential lane 3 +
24	MIPI_D3N	O	MIPI DSI differential lane 3 -
25	GND	P	Ground
26	ID	I	
27	RST_LCD	O	LCD reset
28	GND	P	Ground
29	VCC1V8_LCD	P	1.8V power supply for LCD
30	VCC3V3_LCD	P	3.3V power supply for LCD
31	VCC3V3_LCD	P	3.3V power supply for LCD

This port is designed not to be used simultaneously with the HDMI port, and you are advised to make a choice between the two before shipment because the software images might be different.

2.4.6 J23/J27 MIPI CSI (6)

VT-SBC35-3562 offers two 4-lane MIPI CSI connector for connecting cameras.

Specification: 1 x 31, 0.3mm, 1.0mm (H), RA, WDT, SMT, RoHS



Pinout description:

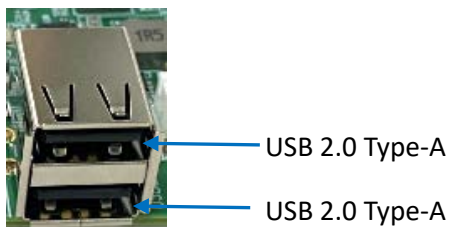
Pin	Name	Type	Description
1	GND	P	Ground
2	MIPI_CSI_D3N	I	MIPI CSI Lane3 -
3	MIPI_CSI_D3P	I	MIPI CSI Lane3 +
4	GND	P	Ground
5	MIPI_CSI_D2N	I	MIPI CSI Lane 2 -
6	MIPI_CSI_D2P	I	MIPI CSI Lane 2 +
7	GND	P	Ground
8	MIPI_CSI_D1N	I	MIPI CSI Lane 1 -
9	MIPI_CSI_D1P	I	MIPI CSI Lane 1 +
10	GND	P	Ground
11	MIPI_CSI_D0N	I	MIPI CSI Lane 0 -

Pin	Name	Type	Description
12	MIPI_CSI_D0P	I	MIPI CSI Lane 0 +
13	GND	P	Ground
14	MIPI_CSI_CLKN	I	MIPI CSI clock -
15	MIPI_CSI_CLKP	I	MIPI CSI clock +
16	GND	P	Ground
17	MIPI_CSI_SCL	O	Camera I ² C serial clock
18	MIPI_CSI_SDA	I/O	Camera I ² C serial data
19	MIPI_CSI_RST	O	Camera reset signal
20	MIPI_CSI_PDN	O	Camera power down signal
21	GND	P	Ground
22	MIPI_CSI_MCLK	O	Camera main clock
23	GND	P	Ground
24	NC		
25	IO_1V8_J	P	1.8V Power supply
26	IO_1V8_J	P	1.8V Power supply
27	Core_1V5_J	P	1.5V Power supply
28	AF_2V8_J	P	2.8V Power supply
29	PWR_2V8_J	P	2.8V Power supply
30	NC		
31	GND	P	Ground

2.4.7 U3920 USB Type-A (7)

VT-SBC35-3562 offers two USB 2.0 Type-A in stacked configuration, allowing users to connect peripherals to expand the board function.

The pinout description of the USB interfaces is in line with the pin assignment of standard USB 2.0 Type-A.



2.4.8 J2/J22 USB 2.0 (8)

The board implements two USB 2.0 headers for flexibly connecting peripherals such as a USB keyboard, USB flash drive, or USB camera.

Please note that the USB header (J2) located behind the stacked USB 2.0 Type-A ports is not intended for simultaneous use with the USB 2.0 Type-A port on the top.

Specification: 1 x 4, 2.0mm, 6mm (H), male, Vert, WDT, THR, RoHS



1

Pinout description:

Pin	Name	Type	Description
1	USB2.0_VCC	P	USB Power supply
2	USB2.0_DM	I/O	USB data -
3	USB2.0_DP	I/O	USB data +
4	GND	P	Ground

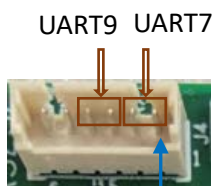
2.4.9 J5 USB 2.0 Type-C (9)

VT-SBC35-3562 offers a USB 2.0 Type-C interface supporting the OTG feature. Users can use this interface for debugging or programming the board.

2.4.10 J4 RS232 (10)

VT-SBC35-3562 implements a 6-pin header, offering two RS232 ports. Pins 1 and 2 correspond to UART7, which is designated as /dev/ttyS7 in the file system, while pins 3 and 4 correspond to UART9, mapped as /dev/ttyS9.

Specification: 1 x 6, 1.25mm, male, Vert, WDT, THR, RoHS



1

Pinout description:

Pin	Name	Type	Description	Port
1	RS232_TXD1	O	RS232_1 transmit data	UART7
2	RS232_RXD1	I	RS232_1 receive data	
3	RS232_TXD2	O	RS232_2 transmit data	UART9
4	RS232_RXD2	I	RS232_2 receive data	
5	GND	P	Ground	/
6	GND	P	Ground	/

2.4.11 J10/J7 RS232/422/485 (11)

VT-SBC35-3562 provides two RS232/RS485/RS422 multiplexers. J10 is named as UART5 and J7 is names as UART6, mapped as /dev/ttyS5 and /dev/ttyS6, respectively in the file system.

Specification: 1 x 5, 1.25mm, male, RA, WDT, THR, RoHS



1

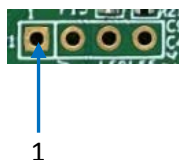
Pinout description:

Pin	Name	Type	Description
1	RS422_Z/RS485_B/RS232_TXD	I/O	RS422_Z/RS485_B/RS232 transmit data
2	RS422_Y/RS485_A	I/O	RS422_Y/RS485_A
3	RS422_B	I/O	RS422_B
4	RS422_A/RS232_RXD	I/O	RS422_A/RS232 receive data
5	GND	P	Ground

2.4.12 J12 Optional debug UART (12)

In addition to the USB Type-C port that users can use for board debugging, VT-SBC35-3562 provides an optional 4-pin debug UART for the same purpose. The pins will be populated based on customer needs.

Specification: 1 x 4, 2.54mm, male, Vert



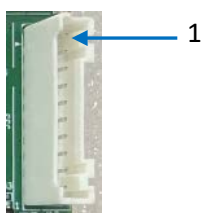
Pinout description:

Pin	Name	Type	Description
1	VCC	P	1.8V power supply
2	TX	O	Transmit data
3	RX	I	Receive data
4	GND	P	Ground

2.4.13 J33 GPIO (13)

There is a GPIO header on the board, providing 8 GPIOs and user can customize the use of the pins based on needs.

Specification: 1 x 10, 2.0 mm, 7.7 mm (H), Vert, -25~85°C, THR, RoHS



Pinout description:

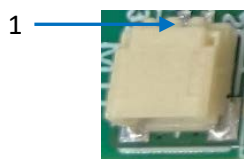
Pin	Name	Type	Description
1	VCC_3V3	P	3.3V power supply
2	EX_GPIO_0	I/O	General-purpose input and output
3	EX_GPIO_1	I/O	General-purpose input and output
4	EX_GPIO_2	I/O	General-purpose input and output
5	EX_GPIO_3	I/O	General-purpose input and output
6	EX_GPIO_4	I/O	General-purpose input and output

Pin	Name	Type	Description
7	EX_GPIO_5	I/O	General-purpose input and output
8	EX_GPIO_6	I/O	General-purpose input and output
9	EX_GPIO_7	I/O	General-purpose input and output
10	GND	P	Ground

2.4.14 J30 Speaker (14)

The board offers a 2-pin speaker header for mono audio output.

Specification: 1 x 2, 1.0mm, RA, -25~85°C



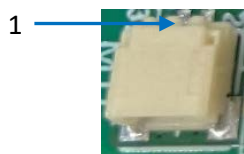
Pinout description:

Pin	Name	Type	Description
1	SPKN	O	Speaker output -
2	SPKP	O	Speaker output +

2.4.15 J31 Mic (15)

The board offers a 2-pin Mic header for mono-channel sound capturing.

Specification: 1 x 2, 1.0mm, RA, -25~85°C



Pinout description:

Pin	Name	Type	Description
1	MIC_P	I	Microphone input
2	GND	P	Ground

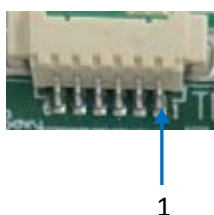
2.4.16 J32 Audio jack (16)

VT-SBC35-3562 offers a 3.5mm combo audio jack compatible with four-section headphone output, supporting microphone input.

2.4.17 J4 Touch panel (17)

VT-SBC35-3562 offers an I²C touch panel header for connecting a touch panel.

Specification: 1 x 6, 1.25mm, RA, -25~85°C



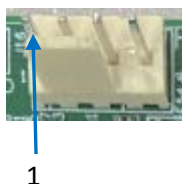
Pinout description:

Pin	Name	Type	Description
1	TP_VDD_3.3V	P	3.3V power supply
2	TP_I2C_SDA	I/O	I2C_SDA for TP
3	TP_I2C_SCL	I/O	I2C_SCL for TP
4	TP_INT	I/O	TP interrupt
5	TP_RST	I/O	TP reset
6	GND	I/O	Ground

2.4.18 J16 Fan (18)

There is a fan connector on the board for connecting a fan to cool down the board.

Specification: 1 x 4, 2.0mm



Pinout description:

Pin	Name	Type	Description
1	GND	P	Ground
2	5V	P	5V power supply
3	NC		
4	PWM-CONTROL	I/O	PWM control output

2.4.19 Keys (19)

VT-SBC35-3562 offers five keys, including a volume + button, a volume - button, an on/off button, a reset button, and a MASKrom button for image flashing.



2.4.20 J24 M.2 Key B slot (20)

VT-SBC35-3562 offers an M.2 Key B slot that supports PCIe (2242) for interfacing with an SSD for storage expansion, or USB 2.0 (3052) for connecting a 4G module or PCIe 2.0 (3052) for connecting a 5G module for cellular communication.



2.4.21 J18 Micro SIM (21)

VT-SBC35-3562 offers a Micro SIM card slot for cellular communication.

Specification: Micro SIM, push-push, hot pluggable

2.4.22 RTC

The board offers a real-time clock for keeping track of the current time and date even when the board is turned off or rebooted. This ensures the board operates efficiently and reliably with respect to time-sensitive tasks and functions.

Specification of the battery:

Nominal voltage: 3V; nominal capacity: 35mAh; continuous drain: 0.1mA; operating temperature: -30°C ~ +85°C.

CHAPTER 3 DEBIAN SYSTEM MANUAL

VT-SBC35-3562 is running Debian 11 operating system. In order to properly test the functionality of the board described in this chapter, you are advised to connect the board to a mouse, keyboard, and monitor for easier operations.

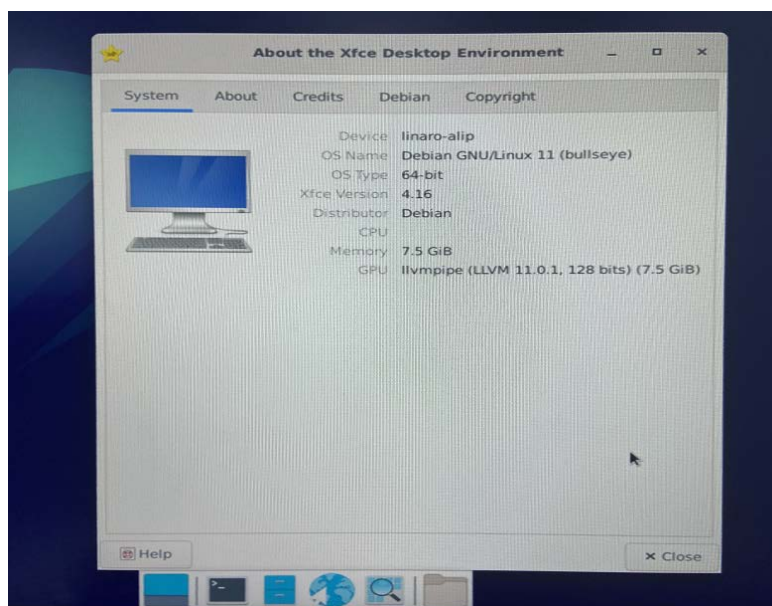
3.1 About the Device


This section will guide you on the use of VT-SBC35-3562 on Debian 11 operating system. Upon startup, the board will automatically log in without requiring the input of the password. However, the password for the default user “linaro” is “linaro” in case you need to switch users or create a new user.

If you need to switch to the root user for higher privilege in the device terminal, simply use the `sudo su` command without the need to enter a password.

3.1.1 Device information

1. Power on the board and the system will log in to linaro as the default user;
2. Right click the mouse in an empty area to open the property dialogue of the board;
3. Click **Applications > About Xface** to enter the desktop environment, then you can check the system information like device name, operating system, copyright statement, etc.



4. Press Ctrl + Alt +T simultaneously or click the **LXTerminal** () tool from the taskbar at the bottom of the screen to open a terminal;
5. Switch to the root user using the command `sudo su`;
6. Check the Debian operating system version.

```
# cat /etc/ver-info.txt
```

3.1.2 System settings

By clicking on **linaro** on the top right corner of the screen, you can

- Lock the screen;
- Switch the user;
- Shut down/suspend the board;
- (Upon a click of the “Log out” option) Log out/restart/shut down/suspend the board or switch the user while saving the session for future logins.

The menu bar on the top of the screen allows the user to:

- Change the brightness and power settings of the board;
- Adjust the system volume and sound settings;
- Add the board to a Wi-Fi or Ethernet or mobile network and pair it with a Bluetooth device;
- Switch between different workspaces.

Other system settings are accessible from **Applications** on the top left corner of the screen or upon a right click of the mouse in an empty area of the screen.

3.1.3 User settings

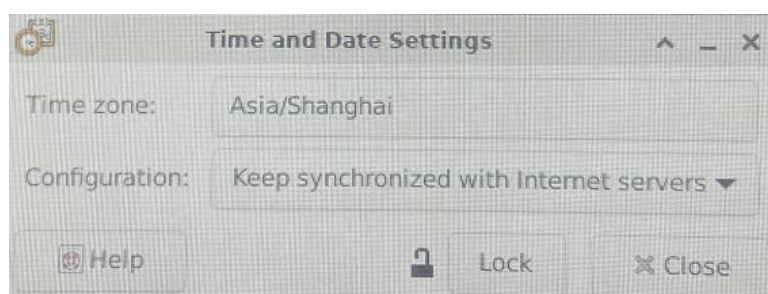
To access and modify user settings:

1. Click **Applications** on the top left corner of the screen or right click the mouse in an empty area of the screen to call the menu;
2. Navigate to **Settings > Users and Groups** where you can:
 - Change the user name and login password
 - Add or delete users
 - Manage user groups
 - Set user information or permissions
 - Others

3.1.4 Time and date

To change the system time and date, click **Applications** on the top left corner of the screen or right click the mouse in an empty area of the screen to call the menu:

1. Click **System > Time and Date** to open the Time and Date setup page;
2. Click **Unlock** and enter the password (linaro) before editing;
3. Click Time zone and select your own time zone from the list;
4. Choose to synchronize the time with the Internet server or fill in the time manually;



5. Click **Lock** to let the settings take effect.

Use the command lines to set the time zone:

1. Check the time zone;

```
# tzselect
```

2. Follow the screen prompt to select the time zone and region (Detroit, US for instance);
3. Copy the time zone file to the local time directory (/etc/localtime);

```
cp /usr/share/zoneinfo/America/Detroit /etc/localtime
```

4. Check the current time zone.

```
# cat /etc/timezone
```

Note: These methods only modify the software system date and time, which may revert to the original settings upon device restart. To address this issue, refer to section 3.2.14 to adjust the RTC (hardware time).

3.2 Interfaces

3.2.1 EEPROM

EEPROM is a non-volatile memory that retains stored data even when the power is turned off. The device information is stored in the EEPROM.

Please use the following command to access the device information stored in the EEPROM.



```
# vtvdm -h

vtvdm version 1.5.0
Copyright (C) 2021 Vantron
-r [sn | eth_mac<0-7> | hw_major | hw_minor | product_id | token | sys_repo_id |
mcu_repo_id | mac_num ]
-w [sn | eth_mac<0-7> | hw_major | hw_minor | product_id | token | sys_repo_id |
mcu_repo_id ] info
-i,  init the eeprom with NULL
-u,  update the eeprom layout to upon v4
-h,  display the help message
-v,  display the version
vtvdm version 1.5.0
Copyright (C) 2021 Vantron
```

3.2.2 Wi-Fi

Before connecting to a Wi-Fi network, please install the Wi-Fi antennas to the ANTO and ANT1 connectors for better signal strength.

Using the GUI:

1. Click the network icon () on the taskbar in the upper right corner of the screen;
2. Select the desired SSID from the available list;
3. Click the **More networks** option to expand the list, if needed;
4. Enter the password for the network;
5. Once the device is connected to the target network, a “**Connection Established**” prompt will be displayed, indicating the name of the network you are connected to, and the network icon will change to a wireless network icon ();
6. You can click **Disconnect** below the SSID to disconnect the device from the network.

Use the NetworkManager program:

1. Turn off the Wi-Fi feature;

```
# nmcli r wifi off
```

2. Turn on the Wi-Fi feature;

```
# nmcli r wifi on
```

3. Scan for available Wi-Fi hotspots;

```
# nmcli dev wifi list
```

4. Connect to an existing SSID;

```
# nmcli dev wifi connect <ssid> password <password>
```

5. Check the Wi-Fi connection status:

```
# nmcli dev status
```

6. Disconnect the current hotspot:

```
# nmcli dev disconn wlan0 // wlan0 is the network interface of the board
```




7. Reconnect to the previously connected hotspot:

```
# nmcli dev conn wlan0
```


8. Delete the connection:

```
# nmcli connect delete <ssid>
```


3.2.3 Pairing with a Bluetooth device

1. Tap on the Bluetooth icon () on the taskbar in the bottom right corner of the screen;
2. Select the **Turn Bluetooth On** option;
3. Tap on the Bluetooth on icon () and select the **Set Up New Device** option;
4. In the Bluetooth device setup window, tap on **Next** and the available Bluetooth devices will be displayed;
5. Navigate through the list to locate the desired Bluetooth device, select it and tap on **Next**;
6. Select **Pair Device** as the pairing method and tap on **Next**;
7. Confirm the pair code on both devices;
8. Select the **Connect to: Audio source** option on the board, and tap on **Next**;
9. In the final step, there will be a message indicating that the target device is successfully added and connected;
10. The Bluetooth icon on the taskbar will change accordingly ()

3.2.4 Sending a file to a Bluetooth device

1. Tap on the Bluetooth on icon () and select the **Send Files to Device** option;
2. Select the file you intend to send and tap on **OK**;
3. Select the target device from the device list and tap on **OK**;
4. If the two devices are connected, the file transfer will be initiated immediately. Otherwise, the transfer may fail, and you'll need pair the devices before proceeding;
5. Wait for the file to be transferred.

3.2.5 Ethernet

After connecting the board to Internet through either of the Ethernet jacks, you can use the GUI to configure the Ethernet network upon clicking the network icon () on the taskbar in the upper right corner of the screen.

Alternatively, you can use the terminal to check the network information as shown below.

1. Open a terminal by pressing Ctrl + Alt + T;
2. Use the `ifconfig` command to check the information of the network interfaces (eth0 /eth1):

```
# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.19.208 netmask 255.255.255.0 broadcast 192.168.19.255
    inet6 fe80::239b:dba1:dc0f:5535 prefixlen 64 scopeid 0x20<link>
    ether 12:34:24:00:9a:bc txqueuelen 1000 (Ethernet)
    RX packets 2384 bytes 219409 (214.2 KiB)
    RX errors 0 dropped 961 overruns 0 frame 0
    TX packets 122 bytes 9667 (9.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 70

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.19.202 netmask 255.255.255.0 broadcast 192.168.19.255
    inet6 fe80::cc9f:7dd0:bc71:bc1d prefixlen 64 scopeid 0x20<link>
    ether 12:88:66:00:9a:bc txqueuelen 1000 (Ethernet)
    RX packets 224 bytes 2312 (2.2 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 17 bytes 2872 (2.8 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 73
```

3. Assign a static IP address of the same network to an Ethernet jack and test the connectivity:

```
# ifconfig eth0 192.168.19.10
# ping 192.168.19.10
PING 192.168.19.10 (192.168.19.10): 56 data bytes
64 bytes from 192.168.19.10: seq=0 ttl=64 time=1.296 ms
64 bytes from 192.168.19.10: seq=1 ttl=64 time=1.358 ms
```

3.2.6 4G/5G

VT-SBC35-3562 implements an M.2 key B slot for connecting either an SSD card for storage expansion or a 4G/5G cellular module for wireless communication.

Before you set up the cellular network, make sure a cellular module is installed in the M.2 Key B slot and an activated SIM card is inserted into the Micro SIM slot. When the board is powered up, the cellular module will be booted.

If you select the cellular module provided by Vantron, a built-in script will run upon system bootup and automatically configure the board to connect to network.

Check the 4G/5G network interface information and test the connectivity:

```
# ifconfig
ppp0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu
    inet 10.187.130.87 netmask 255.0.0.0 broadcast 10.255.255.255
    inet6 2409:8962:320:2118:634:c33c:36fa:2d0b prefix 64 scopeid 0x0<global>
    inet6 fe80::1d91:c03b:cf20:44ff prefixlen 64 scopeid 0x20<link>
    ether 02:0c:29:a3:9b:6d txqueuelen 1000 (Ethernet)
    RX packets 23 bytes 3204 (3.1 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 40 bytes 5416 (5.2 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

# ping www.bing.com
PING www.bing.com(2409:8c00:6c21:1051:0:ff:b0af:279a) 56 data bytes
64 bytes from 2409:8c00:6c21:1051:0:ff:b0af:279a: icmp_seq=1 ttl=51 time=78.3 ms
64 bytes from 2409:8c00:6c21:1051:0:ff:b0af:279a: icmp_seq=2 ttl=51 time=56.6 ms
64 bytes from 2409:8c00:6c21:1051:0:ff:b0af:279a: icmp_seq=3 ttl=51 time=66.5 ms
64 bytes from 2409:8c00:6c21:1051:0:ff:b0af:279a: icmp_seq=4 ttl=51 time=57.6 ms
```

```
64 bytes from 2409:8c00:6c21:1051:0:ff:b0af:279a: icmp_seq=5 ttl=51 time=52.7 ms
--- www.bing.com ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 6560ms
rtt min/avg/max/mdev = 52.729/62.223/78.311/8.373 ms
```

3.2.7 USB

Insert a USB flash drive or other device into a USB interface of the board, and input the following commands to check/configure the USB device.

1. Check the information of all connected USB devices:

```
$ lsusb
```

2. Display details of all storage devices and their partitions:

```
$ fdisk -l
```

3. Mount a USB flash drive (applicable to storage devices only) to a specified directory (e.g., /mnt):

```
$ mount /dev/xxx /mnt
```

4. Check the mounted content:

```
$ ls /mnt
```

5. Unmount the USB flash drive:

```
$ umount /dev/xxx
```

3.2.8 RS232

VT-SBC35-3562 implements a 6-pin header, offering two RS232 ports. Pins TX1 and RX1 correspond to UART7, mapped as /dev/ttyS7 in the file system, while pins TX2 and RX2 correspond to UART9, mapped as /dev/ttyS9.

Please refer to the pinout of the header in 2.4.10.

The parameters of the ports are set to 115200, 8N1.

Follow the steps below to test the data communication over the ports.

1. Use an RS232 to USB adapter and Dupont wires or other way to connect UART7/UART9 to the host computer (TX-RX, RX-TX, GND-GND);
2. Use a serial utility, such as “uartarm”, to open the port (UART7 for demonstration) for data transmission.

```
# uartarm -d /dev/ttyS7 -b 115200 -s
```

3.2.9 RS232/422/485

VT-SBC35-3562 provides two RS232/RS485/RS422 multiplexers. J10 is named as UART5 and J7 is named as UART6, mapped as /dev/ttyS5 and /dev/ttyS6, respectively in the file system.

Please refer to the pinout of the headers in 2.4.11.

The multiplexers are set to RS232 by default, and they will resume to the RS232 mode after each reboot.

The parameters of the ports are set to 115200, 8N1.

Follow the steps below to test the data communication over the ports.

- UART5 to operate in RS232

1. Use a serial to USB adapter and Dupont wires or other way to connect UART5 to the host computer (TX-RX, RX-TX, GND-GND);
2. Enable RS232 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 0 > /sys/class/leds/rs485_en0/brightness  
# uartarm -d /dev/ttyS5 -b 115200 -s
```

- UART5 to operate in RS485

1. Use a serial to USB adapter and Dupont wires or other way to connect UART5 to the host computer (A-A, B-B, GND-GND);
2. Enable RS485 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 1 > /sys/class/leds/rs485_en0/brightness  
# uartarm -d /dev/ttyS5 -b 115200 -s
```

- UART5 to operate in RS422

1. Use a serial to USB adapter and Dupont wires or other way to connect UART5 to the host computer (A-Y, B-Z, GND-GND);
2. Switch from RS485 mode to RS422 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 1 > /sys/class/leds/rs485_en0/brightness  
# echo 1 > /sys/class/leds/rs422_en0/brightness  
# uartarm -d /dev/ttyS5 -b 115200 -s
```


- UART6 to operate in RS232
1. Use a serial to USB adapter and Dupont wires or other way to connect UART6 to the host computer (TX-RX, RX-TX, GND-GND);
 2. Enable RS232 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 0 > /sys/class/leds/rs485_en1/brightness  
# uartarm -d /dev/ttyS6 -b 115200 -s
```

- UART6 to operate in RS485
1. Use a serial to USB adapter and Dupont wires or other way to connect UART6 to the host computer (A-A, B-B, GND-GND);
 2. Enable RS485 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 1 > /sys/class/leds/rs485_en1/brightness  
# uartarm -d /dev/ttyS6 -b 115200 -s
```

- UART6 to operate in RS422
1. Use a serial to USB adapter and Dupont wires or other way to connect UART6 to the host computer (A-Y, B-Z, GND-GND);
 2. Switch from RS485 mode to RS422 mode and use a serial utility, such as “uartarm”, to open the port for data transmission.

```
# echo 1 > /sys/class/leds/rs485_en1/brightness  
# echo 1 > /sys/class/leds/rs422_en1/brightness  
# uartarm -d /dev/ttyS6 -b 115200 -s
```

3.2.10 GPIO

VT-SBC35-3562 offers 8 GPIOs for user expansion. GPIO0 ~ GPIO7 correspond to number 8 ~ 15, respectively on gpiochip7.

The following table summarizes the commands for setting the high/low level of the GPIO pins.

GPIOs		
GPIO0	High level	# gpioset gpiochip7 8=1
	Low level	# gpioset gpiochip7 8=0
GPIO1	High level	# gpioset gpiochip7 9=1
	Low level	# gpioset gpiochip7 9=0
GPIO2	High level	# gpioset gpiochip7 10=1
	Low level	# gpioset gpiochip7 10=0
GPIO3	High level	# gpioset gpiochip7 11=1
	Low level	# gpioset gpiochip7 11=0
GPIO4	High level	# gpioset gpiochip7 12=1
	Low level	# gpioset gpiochip7 12=0
GPIO5	High level	# gpioset gpiochip7 13=1
	Low level	# gpioset gpiochip7 13=0
GPIO6	High level	# gpioset gpiochip7 14=1
	Low level	# gpioset gpiochip7 14=0
GPIO7	High level	# gpioset gpiochip7 15=1
	Low level	# gpioset gpiochip7 15=0

To check the value of a GPIO, use the following command:

```
$ gpioget gpiochip7 8 // check the value of GPIO0
```

3.2.11 Audio

When you intend to use the audio feature of the board, prepare a 3.5mm combo audio cable and plug it into the audio jack. Connect a speaker if needed.

1. Adjust the sound card setting and record an audio clip, with a name such as "test_audio.wav". Make sure the file name ends with an audio format;

```
# amixer -c 0 cset numid=28 1  
# arecord -D plughw:0,0 -f S16_LE -c 2 -r 44100 test_audio.wav
```

2. Press "**Ctrl + C**" to stop recording;
3. Output the recorded clip by a speaker connected to the board:

```
# amixer -c 0 cset numid=27 2  
# aplay test_audio.wav
```

4. Output the recorded clip by the earphone of the 3.5mm combo audio cable connected to the board:

```
# amixer -c 0 cset numid=27 3  
# aplay test_audio.wav
```

3.2.12 Camera

1. Insert the flex cable of a camera module into one of the MIPI CSI connector and make sure the cable is facing the correct orientation;
2. Execute the `cheese` command to enable the camera feature or access the **Cheese** application from the **Sound & Video** menu upon a tap of the **Debian** icon on the taskbar;
3. Press the **Space** button on the keyboard to take a photo;
4. Press "**Ctrl + C**" to exit the application.

3.2.13 Fan

There is a fan connector on the board, allowing users to connect an external fan module to cool the board when needed.

1. Turn on the fan:

```
# echo 1 > /sys/class/leds/fan_en/brightness
```

2. Adjust the fan speed:

```
# cd /sys/class/pwm/pwmchip2
# echo 0 > export
# cd pwm0
# echo 10000 > period           // period: 10,000 nanoseconds
# echo 5000 > duty_cycle       // duty cycle: 5,000 nanoseconds
# echo inversed > polarity
# echo 1 > enable
```

3. Turn off the fan:

```
# echo 0 > /sys/class/leds/fan_en/brightness
# echo 0 > /sys/class/pwm/pwmchip2/pwm0/enable
```

3.2.14 RTC

Real-Time Clock (RTC) is a hardware component on the board that keeps track of the device time and date. Adjusting the RTC can help address issues related to time discrepancies or resets in software system time settings.

1. Set the system date & time;

```
# date -s "Aug-04-2024 14:38:10" // replace with your own date and time
```

2. Synchronize the RTC time with the system time;

```
# hwclock -w
```

3. Reboot the device;

```
# reboot
```

4. Check the RTC time information.

```
# hwclock -r
```

3.2.15 Watchdog timer

The watchdog timer is disabled by default. Once enabled, the watchdog timer monitors the system to ensure it's being regularly 'fed'. If the system fails to feed the watchdog within the timeout period (45 seconds by default), it will trigger a reboot, indicating a potential system or application failure.

Write any character **except capital V** to enable and feed the watchdog.

```
# echo A > /dev/watchdog
```

3.2.16 SSD

VT-SBC35-3562 implements an M.2 key B slot for connecting either an SSD card for storage expansion or a 4G/5G cellular module for wireless communication.

To use it for SSD expansion;

1. Insert a PCIe SSD card (2242) into the M.2 Key B slot;
2. Check the SSD information:

```
$ ls /dev/sd*  
  
/dev/sda
```

3. Mount the SSD to a specified directory (e.g., /mnt):

```
$ mount /dev/sda /mnt
```

4. Check the mounted content:

```
$ ls /mnt
```

3.2.17 LED indicator

There are two LED indicators on the board, one power indicator and one user-defined indicator.

Turn on/off the power indicator:

```
# echo 1 > /sys/class/leds/power_led/brightness // turn on  
# echo 0 > /sys/class/leds/power_led/brightness // turn off
```

Turn on/off the user-defined indicator:

```
# echo 1 > /sys/class/leds/led2/brightness // turn on  
# echo 0 > /sys/class/leds/led2/brightness // turn off
```

3.3 Firmware Upgrade in Windows Environment

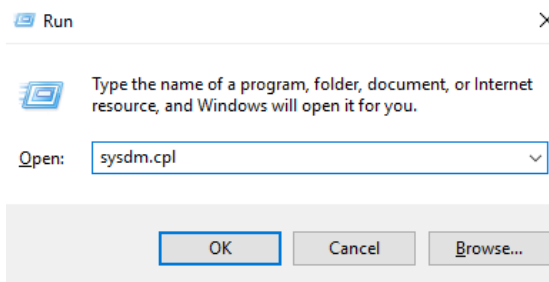
3.3.1 ADB setup on the Windows host

Android Debug Bridge (ADB) is a tool that is designed to connect your development workstation directly to your Android device for debugging, device upgrading, app installation, etc.

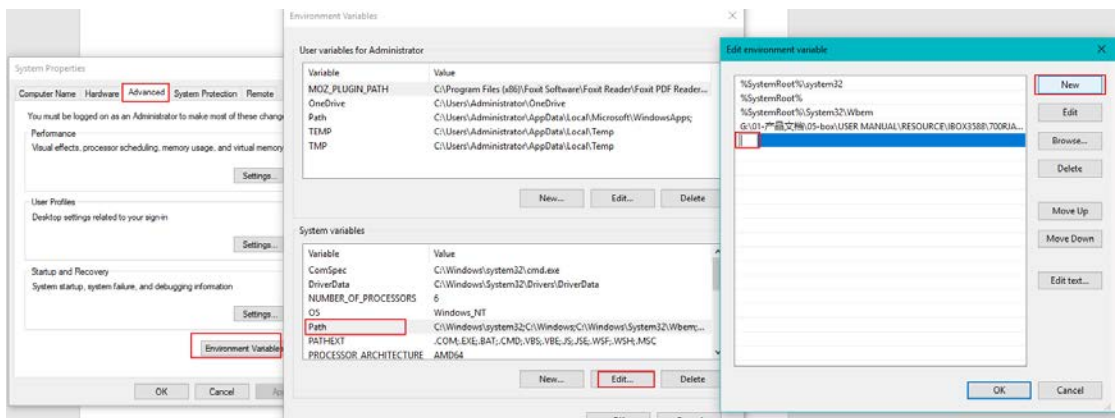
Adding the ADB executable file to the system's environment variable allows you to run the ADB tool regardless of your current working directory.

Follow the steps below to set up the ADB on the Windows host.

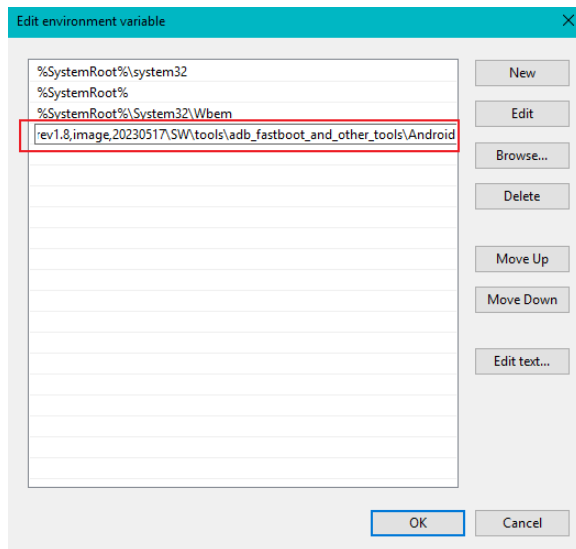
1. Unzip the software release package and navigate to the following directory:
\\SW\downloadertools\windows;
2. Extract the **adbtoolswindows** zip file;
3. Navigate to the **Android** folder that contains the ADB tool kit, and copy the folder path;
4. Press “Win + R” and input **sysdm.cpl** in the dialogue box to open the settings interface;



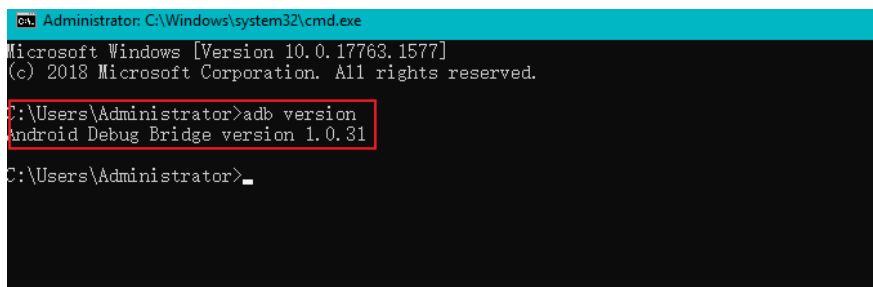
5. Click in sequence **Advanced > Environment Variables > System Variables > Path > Edit**, and click **New** in the pop-up;



- Paste the path of the **Android** folder, and click **OK** one by one to confirm and exit;

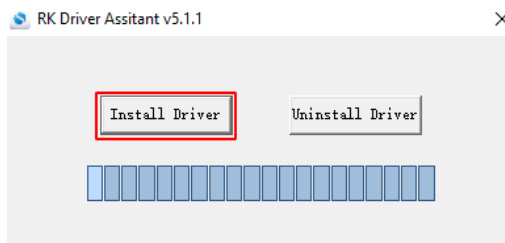


- Press "Win + R" and input `cmd` in the dialogue box;
- Input `adb version` in the command prompt to check if the ADB tool is installed.

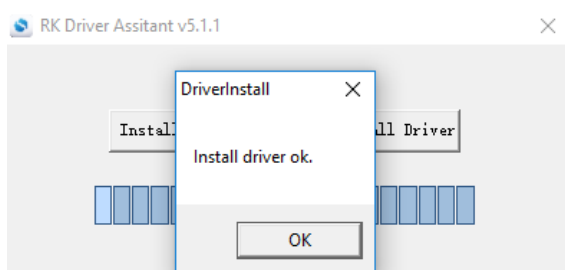


3.3.2 Firmware upgrade

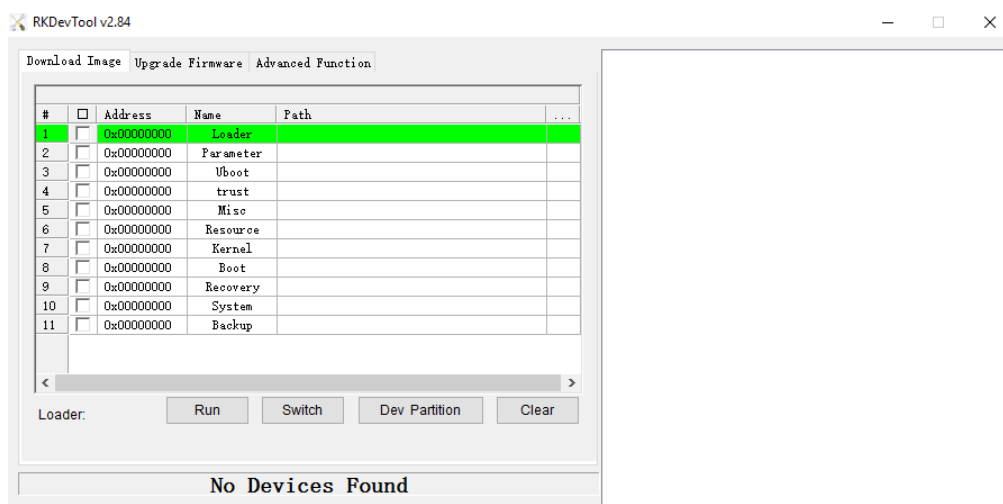
1. Unzip the release package and open the directory of the upgrade driver (\SW\downloadetools\windows\DriverAssitant_vxxx);
2. Right click the mouse and run the driver program **DriverInstall.exe** as administrator;
3. Click **Install Driver** and wait for the installation to proceed;



4. A pop-up will appear in a second suggesting the driver is installed;

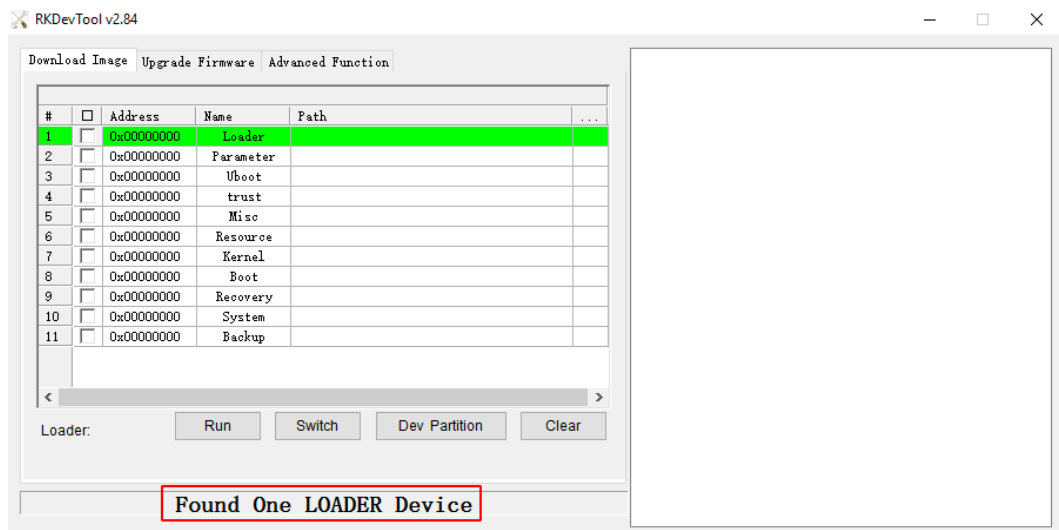


5. Open the directory of the upgrade tool (\SW\downloadetools\windows\RKDevTool_Release_vxxx);
6. Double click the driver for the upgrade tool **RKDevTool.exe** to open the upgrade window;

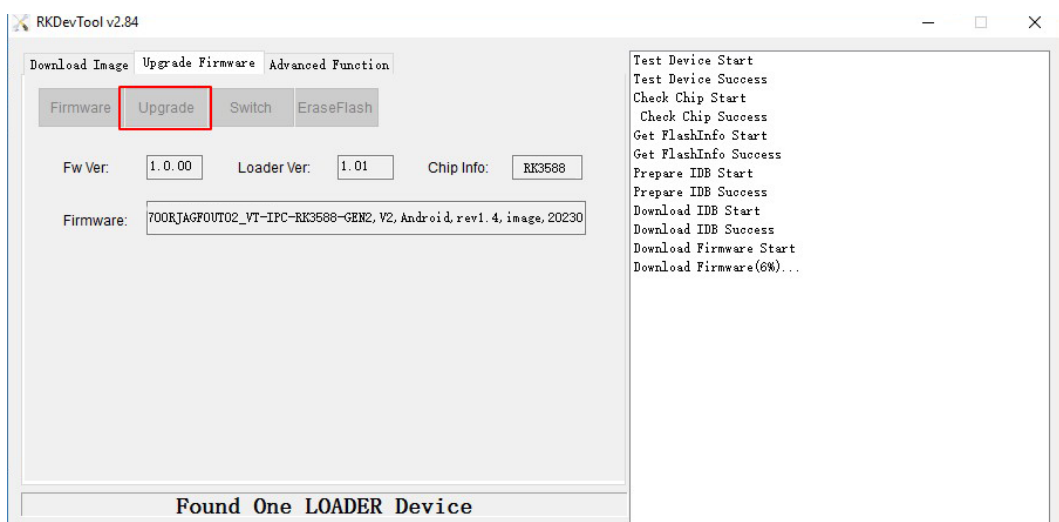


7. Connect VT-SBC35-3562 to the Windows host using a USB Type-A to Type-C cable;

- Press “Win + R” and input `cmd` in the dialog box to open the command prompt;
- Input `adb devices` in the command prompt to check if the board is connected to the Windows host;
- Once the board is identified by the Windows host, input `adb reboot loader` to reboot the board into the bootloader mode;
- Then the upgrade window will prompt for the existence of a Loader device, indicating that the upgrade process is ready;



- Click **Upgrade Firmware > Firmware** in the upgrade window;
- Select the upgrade file (**update.img**) from the directory (`\SW\Image`) and click **Open**, and the firmware details will be automatically populated in the boxes;
- Click the **Upgrade** button and the Board will start to download the image and upgrade the firmware automatically;



- When the upgrade finishes, the Board will reboot automatically.

3.4 Firmware Upgrade in Ubuntu Environment

1. Connect VT-SBC35-3562 to the Ubuntu host using a USB Type-A to Type-C cable;
2. Open a terminal and input the following command to install the ADB tool if necessary;

```
$ sudo apt-get install adb -y
```

3. Check if the board is connected to the Ubuntu host computer via the ADB tool;


```
$ adb devices -l
```

4. Execute `adb shell` to access the board's shell;
5. Run `reboot loader` to reboot the board to the bootloader mode;

```
root@vt-sbc-rk3568-gd32-ark:~# reboot loader
```

6. Copy the release package to the Ubuntu system or save the release package to a USB flash drive and mount the USB drive to the Ubuntu system;
7. Open the directory of the upgrade tool (named as "upgrade_tool" in the package) in the Ubuntu system (`\SW\downloadetools\linux\Linux_Upgrade_Tool_vxxx`) and unzip the folder;
8. Right click the mouse in an empty space of the folder and click **Open in Terminal**;
9. Input the following command to start the upgrade process;

```
$ sudo ./upgrade_tool uf xxx/update.img
```

-  *"xxx" is the path of the image file (update.img), usually found in /SW/Image.*
10. The system will start upgrading after the download finishes, and it will reboot automatically when the upgrade finishes.

CHAPTER 4 DISPOSAL AND PRODUCT WARRANTY

4.1 Disposal

When the device comes to end of life, you are suggested to properly dispose of the device for the sake of the environment and safety.

Before you dispose of the device, please back up your data and erase it from the device.

It is recommended that the device is disassembled prior to disposal in conformity with local regulations. Please ensure that the abandoned batteries are disposed of according to local regulations on waste disposal. Do not throw batteries into fire or put in common waste canister as they are explosive. Products or product packages labeled with the sign of “explosive” should not be disposed of like household waste but delivered to specialized electrical & electronic waste recycling/disposal center.

Proper disposal of this sort of waste helps avoid harm and adverse effect upon surroundings and people’s health. Please contact local organizations or recycling/disposal center for more recycling/disposal methods of related products.

4.2 Warranty

Product warranty

VANTRON warrants to its CUSTOMER that the Product manufactured by VANTRON, or its subcontractors will conform strictly to the mutually agreed specifications and be free from defects in workmanship and materials (except that which is furnished by the CUSTOMER) upon shipment from VANTRON. VANTRON's obligation under this warranty is limited to replacing or repairing at its option of the Product which shall, within **24 months** after shipment, effective from invoice date, be returned to VANTRON's factory with transportation fee paid by the CUSTOMER and which shall, after examination, be disclosed to VANTRON's reasonable satisfaction to be thus defective. VANTRON shall bear the transportation fee for the shipment of the Product to the CUSTOMER.

Out-of-Warranty Repair

VANTRON will furnish the repair services for the Product which are out-of-warranty at VANTRON's then-prevailing rates for such services. At customer's request, VANTRON will provide components to the CUSTOMER for non-warranty repair. VANTRON will provide this service as long as the components are available in the market; and the CUSTOMER is requested to place a purchase order up front. Parts repaired will have an extended warranty of 3 months.

Returned Products

Any Product found to be defective and covered under warranty pursuant to Clause above, shall be returned to VANTRON only upon the CUSTOMER's receipt of and with reference to a VANTRON supplied Returned Materials Authorization (RMA) number. VANTRON shall supply a RMA, when required within three (3) working days of request by the CUSTOMER. VANTRON shall submit a new invoice to the CUSTOMER upon shipping of the returned products to the CUSTOMER. Prior to the return of any products by the CUSTOMER due to rejection or warranty defect, the CUSTOMER shall afford VANTRON the opportunity to inspect such products at the CUSTOMER's location and no Product so inspected shall be returned to VANTRON unless the cause for the rejection or defect is determined to be the responsibility of VANTRON. VANTRON shall in turn provide the CUSTOMER turnaround shipment on defective Product within **fourteen (14) working days** upon its receipt at VANTRON. If such turnaround cannot be provided by VANTRON due to causes beyond the control of VANTRON, VANTRON shall document such instances and notify the CUSTOMER immediately.