H-T972 Mainboard Specification

Version	V1.0
Date	2023-08-28

Changelog

1.0.0	2023-07-15	Chinese and English merged version.
1.0.1	2023-08-28	Updated HDMIin maximum support 4K@60Hz signal.

Contents

1 Product Overview

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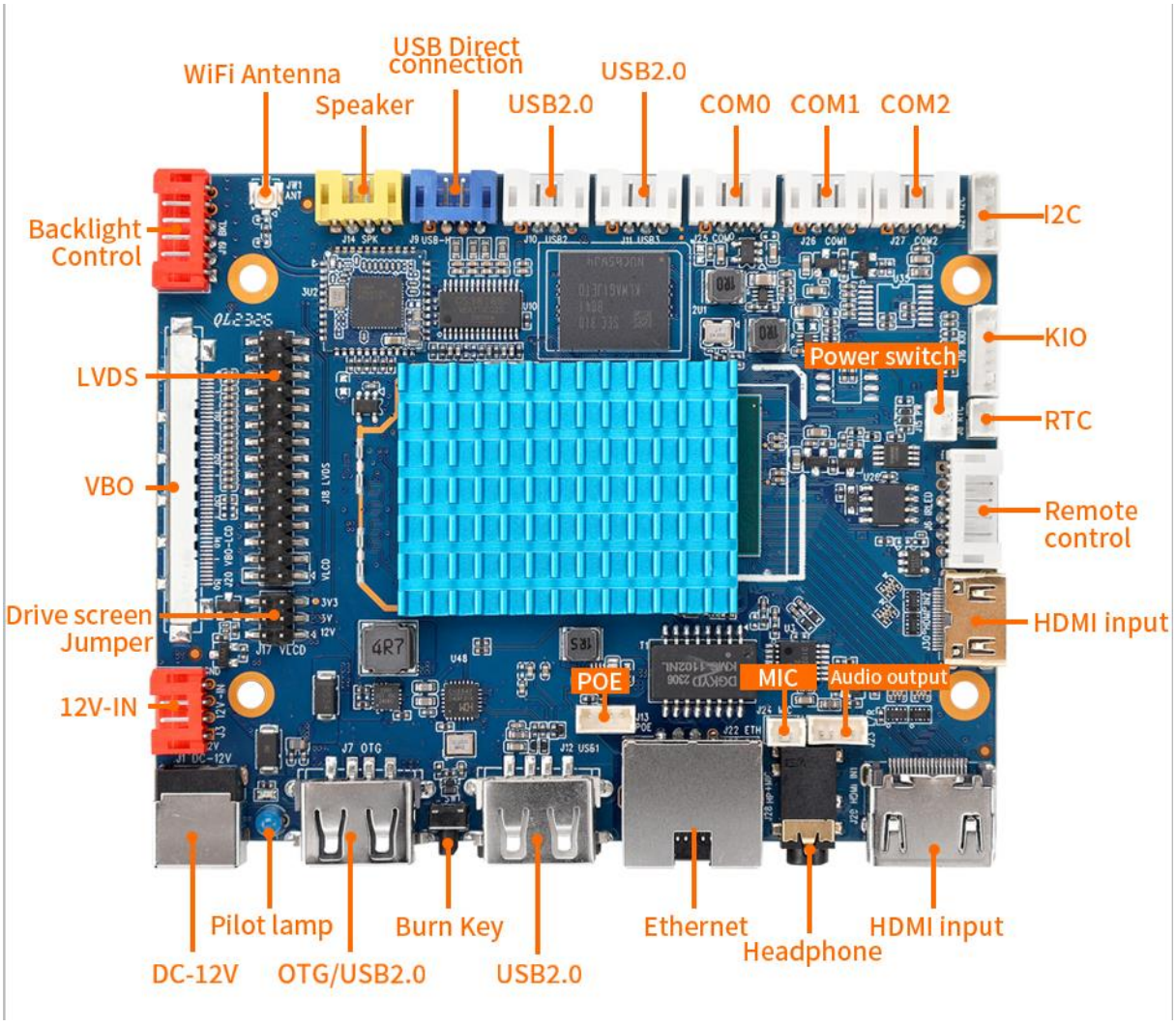
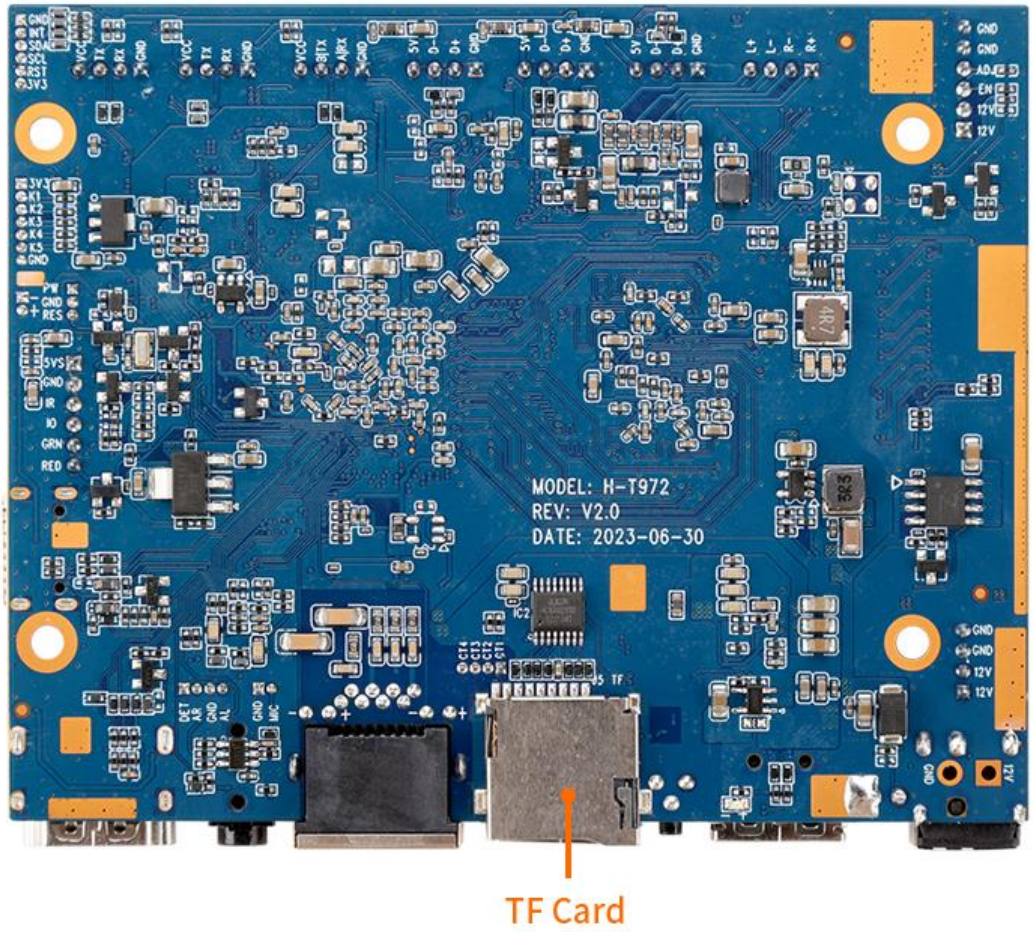
H-T972 mainboard is based on Amlogic T972 high-performance application processor platform, T972 main chip integrated quad-core Cortex-A55, Mali-G31 MP2 high-performance GPU, up to 1.9GHz, with superior computing performance, 2D/3D graphics processing capabilities and full HD video codec capabilities. Perfect support for 4Kx2K@60fps ultra HD decoding and 4Kx2K HDMI ultra HD output.

This mainboard is specially designed for **ultra-thin** applications with strict material selection and design. The compact size and rich interface facilitate its integration into the complete machine, bringing a smooth experience and superior performance to the final product. It can be applied to digital signage, touch interactive, consumer electronics, entertainment systems and other industries.

H-T972 V2.0 mainboard actual interface diagram as shown below.




MODEL: H-T972
REV: V2.0
DATE: 2023-06-30
TF Card

2 Specification List

H-T972's system functions and interface features are shown in the following table.

Function & Interface	Detailed Description
CPU	Amlogic T972 Cortex-A55 quad-core, up to 1.9GHz
DDR	LPDDR4 2GB (1GB optional)
Storage	The default comes with an 16GB eMMC NAND chip that can scale up to 128GB
LVDS	30-pin industry-standard dual LVDS supporting VESA/JEITA format up to 1080P output
4K LCD	Industry-standard 51-Pin 4K LCD cable VBO display interface (VBO or LVDS, choose one)
HDMI Input	2-way HDMI 2.0 standard video input interface up to 4K@60Hz input signal
HP/Mic	Support CTIA 4-pole HP/Mic socket (Left-Right-GND-Mic)
Line Output	Support standard left and right channel line output (pin header)
Amplifier output	8 Ohm 6W Dual Audio Amplifier Output
MIC Input	Differential MIC input (pin header)
USB 2.0 Interface	2 horizontal USB 2.0 connectors (Single Socket，one is for OTG), 3 pin headers (one is CPU original USB)
Serial Port	1 TTL/RS-485 compatible, 2 TTL/RS-232 compatible
TF Card	Self-elastic TF card socket, up to 256GB capacity
Camera	Support USB camera within 5 million pixels
WiFi	Built-in high performance SDIO interface WiFi module, support IEEE 802.11 b/g/n, The default is single frequency 2.4GHz
Bluetooth	Built-in high performance serial interface BT module with support for V2.1+EDR/BT v3.0/BT v3.0+HS/BT v4.2
Ethernet	10/100/1000M Adaptive Ethernet RJ45 connector **+ 4-Pin POE header**
Backlight Control	Industry standard LCD backlight control header, support for backlight switch and brightness adjustment
Infrared RC	Standard infrared receiver pin header
GPIO Signals	5-way GPIO signals for such as GPIO buttons and/or 3.3V digital input/output
I2C Bus	I2C pin header for I2C capacitive screen and etc
Real Time Clock	Ultra-low-power RTC circuit (CR1220 battery) with timer and alarm functionalities
LED Indicator	Blue LED indicator for running
Buttons	Recovery mode button and power switch button
DC Input	Supports 9~15V wide voltage DC power input
Ambient Requirement	Working temperature -20°C ~ 70°C, working humidity 0%~95% (non-condensing)
Physical Size	Length*Width*Height (100mm*80mm*9mm), **PCB top side height 7mm**
Operating System	Recommended Android 9.0

3 Interface definition

➢ J1 DC-12V Socket

[J1] DC-12V power socket, positive outer and negative inner, inner pin diameter 2.0mm, outer ring diameter 5.5mm.

➢ J3 DC-12V Input Header

[J3] DC-12V Input Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	12V	DC Power Input (9~15V)
2	12V	DC Power Input (9~15V)
3	GND	Power Ground
4	GND	Power Ground

➢ J5 TF Card Socket

[J5] Standard TF Card Socket.

➢ J6 Remote Control & LED Header

[J6] Remote Control & LED Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	5VS	Power output supply 5V standby
2	GND	Digital Ground
3	IR	5V level Irda remote control input signal
4	IO	3.3V level GPIO input signal
5	GRN	Running indicator for external green LED
6	RED	Standby indicator for external red LED

➢ J7 USB 2.0 OTG Type A

[J7] USB 2.0 OTG Horizontal Type A Jack (Standard jack).

Note: This interface is connected to the internal USB0 signal and defaults to the firmware burning port when it is powered on. It can be connected to a PC for software burning; after entering Android, it can be set to the USB ADB debugging port or the ordinary USB Host interface through the software.

➢ J8 RTC Battery Header

[J8] RTC Battery Header (SIP-1.25mm Square pad is pin 1).

Pin#	Definition	Note
1	BAT-	3V Coin Battery Negative
2	BAT+	3V Coin Battery Positive

➢ J9 USB 2.0 Host Direct Header

[J9] USB 2.0 Host Direct Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	GND	Digital Ground
2	D+	USB Differential Data+
3	D-	USB Differential Data-
4	5V	Power output 5V

Note: This interface is directly connected to the Host0 port within the CPU. It is recommended to use this independent interface for high-speed devices such as USB 2.0 cameras.

➢ J10 USB 2.0 Host Header

[J10] USB 2.0 Host Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	GND	Digital Ground
2	DP	USB Differential Data+
3	DM	USB Differential Data-
4	5V	Power output 5V

Note: This USB interface is connected to the 1x4 Hub group of Host1.

➢ J11 USB 2.0 Host Header

[J11] USB 2.0 Host Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	GND	Digital Ground

2	D+	USB Differential Data+
3	D-	USB Differential Data-
4	5V	Power output 5V

Note: This USB interface is connected to the 1x4 Hub group of Host1.

➢ J12 USB 2.0 Host Type A

[J12] USB 2.0 Host Horizontal Type A Jack (Standard jack).

Note: This USB interface is connected to the 1x4 Hub group of Host1.

➢ J13 POE PD Header

[J13] POE PD Header (SIP 1.25mm-Square pad is pin 1)

Pin#	Definition	Note
1	CT4	Transformer Center4
2	CT3	Transformer Center3
3	CT2	Transformer Center2
4	CT1	Transformer Center1

Note: The power supply of the POE powered interface comes from the J22 Ethernet port. This interface is externally connected to the POE powered conversion board for 12V power supply conversion. The current size of the 12V power supply is affected by the power supply capability of the POE switch and the conversion capability of the adapter board. The typical current is 1 ~1.5A. This interface supports POE power supply equipment with 1/2 wires of the network cable being positive and 3/6 wires being negative. It can also be connected to POE power supply equipment with 4/5 wires of the network cable being positive and 7/8 wires being negative.

➢ J14 Speaker Header

[J14] Speaker Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	R+	Speaker right channel +
2	R-	Speaker right channel -
3	L-	Speaker left channel -
4	L+	Speaker left channel +

➢ J15 Power Switch & Reset Header

[J15] Power switch & reset Header (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note
1	PW	Power on/off and screen on/off signal
2	GND	Digital Ground
3	RES	Hardware reset signal

➢ J16 KIO Keypad Header

[J16] KIO Keypad Header (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note
1	3V3	Power output supply 3.3V
2	K1	K1 (Regular GPIO #425)
3	K2	K2 (Regular GPIO #426)
4	K3	K3 (Regular GPIO #427)
5	K4	K4 (Regular GPIO #429)
6	K5	K5 (Regular GPIO #430)
7	GND	Digital Ground

Note: All KIO signals can be adjusted to regular GPIO via a separated software version (level is 3.3V).

➢ J17 LVDS Voltage Header

[J17] LVDS Voltage Header (DIP 2.0mm-Square pad is pin 1). If pin 1 and 2 are jumper shorted, the VLCD of J18 is 12V. If pin 3 and 4 are jumper shorted, the VLCD of J18 is 5V. If pin 5 and 6 are jumper shorted, the VLCD of J18 is 3.3V. Please adjust the jumper position according to the actual logic voltage of the LCD screen. Be careful not to jumper to the wrong position or it may damage the LCD screen and the motherboard circuit.

➢ J18 LVDS Header

[J18] Dual LVDS header [DIP 2.0mm-Square pad is pin 1]. **Note: The internal signals of the J18 LVDS and J20 VBO interfaces are multiplexed, and you can only choose one of the two.**

Pin#	Definition	Pin#	Definition
1	VLCD	2	VLCD
3	VLCD	4	GND
5	GND	6	GND

7	RXO0-	8	RXO0+
9	RXO1-	10	RXO1+
11	RXO2-	12	RXO2+
13	GND	14	GND
15	RXOC-	16	RXOC+
17	RXO3-	18	RXO3+
19	RXE0-	20	RXE0+
21	RXE1-	22	RXE1+
23	RXE2-	24	RXE2+
25	GND	26	GND
27	RXEC-	28	RXEC+
29	RXE3-	30	RXE3+

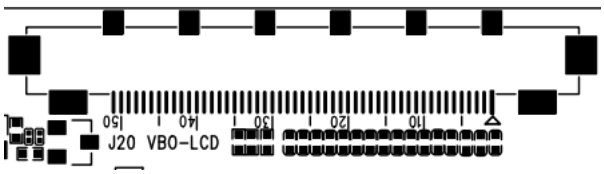
➢ J19 Backlight Control Header

[J19] Backlight Control Header (SIP 2.0mm-Square pad is pin 1).

Pin#	Definition	Note
1	12V	If the current exceeds 2A, external 12V is recommended
2	12V	If the current exceeds 2A, external 12V is recommended
3	EN	The default output is 5V
4	ADJ	3.3V square wave (1KHz Freq.)
5	GND	Power Ground
6	GND	Power Ground

➢ J20 VBO 4K 液晶屏线插座 VBO 4K LCD Cable Socket

[J20] 4K LCD cable socket (I-PEX -0.5mm 51-Pin **Bottom** Contact-Square pad is pin 1). **Note: The internal signals of the J20 VBO and J18 LVDS interfaces are multiplexed, and you can only choose one of the two.**



➢ J21 I2C Bus Header

[J21] I2C Bus Header (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note

1	GND	Digital Ground
2	INT	Interrupt input (3.3V level)
3	SDA	I2C Bus data
4	SCL	I2C Bus clock signal
5	RST	Mainboard reset output (3.3V level)
6	3V3	Power output supply 3.3V

➢ J22 RJ45 Gigabit Ethernet Jack

[J22] RJ45 Gigabit Ethernet Jack (Standard jack).

➢ J23 Audio Line Output

[J23] Audio Line Output (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note
1	DET	HP detection IO (1.8V Level)
2	AR	Stereo output right channel
3	GND	Audio Ground
4	AL	Stereo output left channel

➢ J24 Mic Input Header

[J24] Audio Input Header (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note
1	GND	Audio Ground
2	MIC	Mono microphone input

➢ J25 Data Serial Port 0

[J25] Built-in Serial Port 0 (SIP 2.0mm-Square pad is pin 1). The output level is TTL 3.3V by default and it could be setup to RS-485 if required (RS-232 if U67 mounted). **The related software device node name is ttyS0**.

Pin#	Definition	Note
1	GND	Digital Ground
2	RX	Data receive (TTL or RS-232 level)
3	TX	Data transmit (TTL or RS-232 level)
4	VCC	Power output (Default 3.3V, 5V option)

Note: If you need to use the built-in serial port 0 as a data serial port, please contact the supplier to obtain the customized software; this serial port will output the startup information in the first 5 seconds of power on (the upper or lower machine should handle this kind of data fault tolerance).

➢ J26 Data Serial Port 1

[J26] Built-in Serial Port 1 (SIP 2.0mm-Square pad is pin 1). The output level is TTL 3.3V by default and it could be setup to RS-232 if required (RS-232 if U35 mounted). **The related software device node name is ttyS1**.

Pin#	Definition	Note
1	GND	Digital Ground
2	RX	Data receive (TTL or RS-232 level)
3	TX	Data transmit (TTL or RS-232 level)
4	VCC	Power output (Default 3.3V, 5V option)

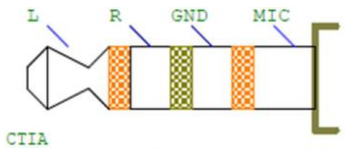
➢ J27 Data Serial Port 2

[J27] Built-in Serial Port 2 (SIP 2.0mm-Square pad is pin 1). The output level is TTL 3.3V by default and it could be setup to RS-232 if required (RS-232 if U35 mounted). **The related software device node name is ttyS2**.

Pin#	Definition	Note
1	GND	Digital Ground
2	RX	Data receive (TTL or RS-232 level)
3	TX	Data transmit (TTL or RS-232 level)
4	VCC	Power output (Default 3.3V, 5V option)

➢ J28 4-Pole HP/Mic Jack

[J28] 4-Pole 3.5mm Headphone & Microphone Jack (CTIA Standard jack). It is the same signals with J19/J20. It supports insert detection for speaker mute.



➢ J29 HDMI Input Socket 1

[J29] Standard HDMI Input Socket 1. The maximum input signal is 4K@60Hz.

➢ J30 HDMI Input Jack 2

[J30] HDMI-C Jack 2 (Type C Mini Jack). The maximum input signal is 4K@60Hz.

➢ ANT WiFi Antenna IPEX

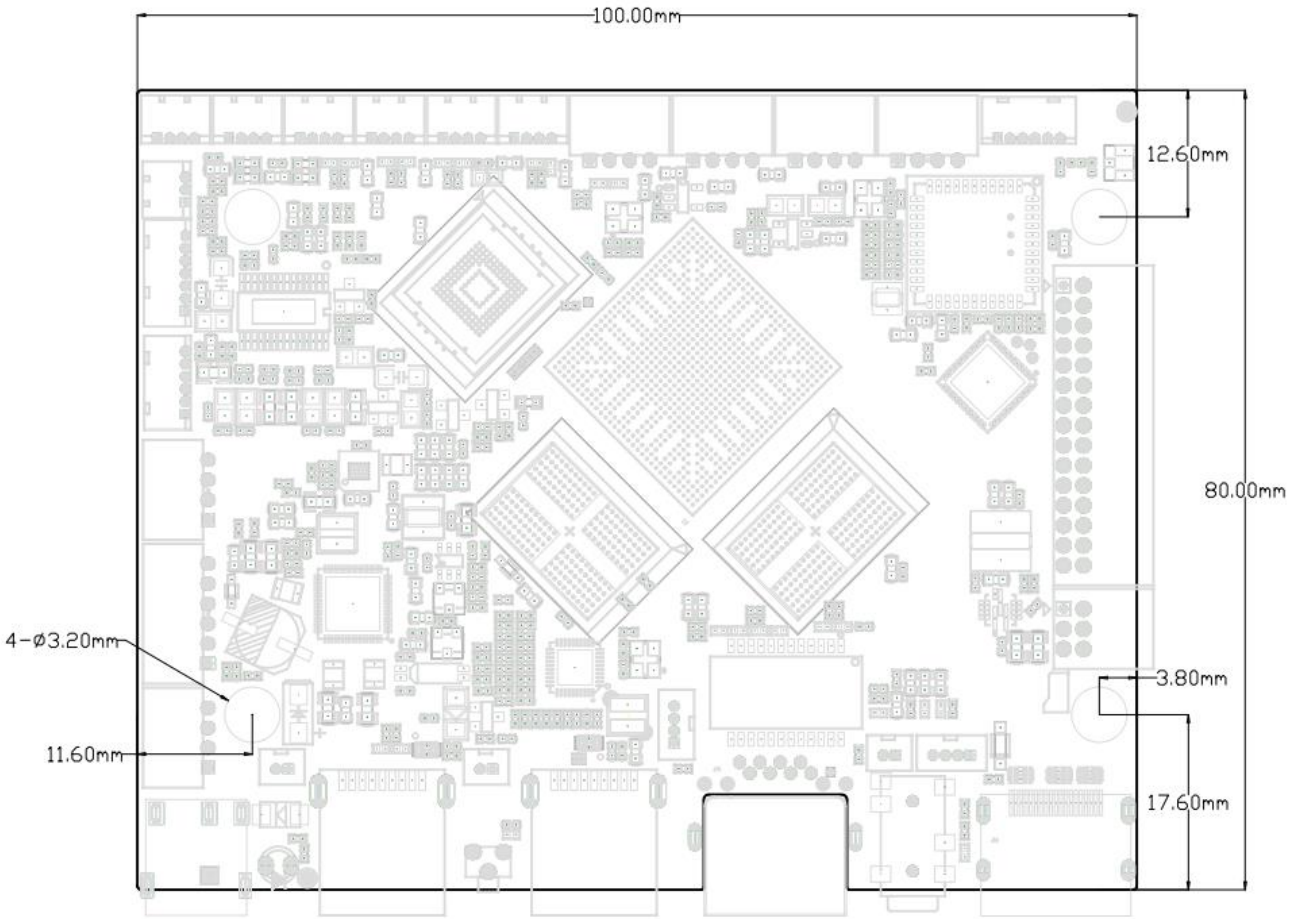
[ANT] Standard IPEX antenna connector (Φ2.0mm).

➢ SW1 Recovery Mode Button

[SW1] On-board recovery mode button. First press and then hold for about 3-second while power on will enter the recovery mode.

4 Physical Size

The PCB size is 100mm*80mm, PCBA height is 7mm, fixed hole diameter is 3.2mm. The corresponding physical size parameters are shown in the figure below. For detailed size information, please consult the manufacturer for DXF file.



5 Assemble Precautions

Please note the following key points when using the H-T972 mainboard:

1. Relative humidity of this product: 10% to 90%, no condensation.
2. The working temperature of this product: -20°C ~ 70°C.
3. This storage temperature of this product: -40°C ~ 70°C.
4. Anti-static treatment is required during assembly and transportation of this product.
5. The board interface connection cable must not be too long. Otherwise, the signal quality may be affected.
6. Never allow the board to be distorted or heavily stressed during assembly.
7. Do not short circuit between mainboard and other peripherals.
8. When connecting to external LVDS or eDP LCD screen, pay attention to whether the screen voltage and current meet the requirements, and pay attention to the screen connector pin-1 direction.
9. When connecting to external LVDS or eDP LCD screen, pay attention to whether the backlight voltage and current meet the requirements. **If the screen backlight power is above 20W, it is recommended to use a separate power board for backlight power supply.**
10. When connecting to peripherals using USB, GPIO, Serial, I2C, SPI, HDMI, etc., pay attention to whether the IO voltage level and current of the peripheral meet the requirements. **When using the power pin on these connectors to supply power to the external circuit, the regular power pin must not exceed 100mA, and the USB power pin must not exceed 500mA.** When the serial port is connected to peripherals, level matching is also required (3.3V TTL level, RS-232 level and RS-485 level)
11. Please connect the power to the power input socket or connector, and evaluate whether the current of the whole board meets the requirements according to the total peripherals. **It is strictly forbidden to directly supply power from the backlight connector.**
12. The communication module should be mounted at least 5mm away from the metal housing to avoid signal interference.

6 Software Guide

The internal serial port and extended serial port software port numbers of the H-T972 motherboard are as follows:

Port	Software Device Node
J25	/dev/ttyS0
J26	/dev/ttyS1
J27	/dev/ttyS2