

H-3399 Mainboard Specification

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Changelog

1.0.0	2022-01-02	Chinese and English merged version.
1.1.0	2022-05-04	Modification based on V3.0 HW.
1.1.1	2022-09-24	Added the interface annotation diagram for v3.0.
1.1.2	2022-10-13	Modification based on V4.0 HW.
1.1.3	2023-01-10	Add physical size diagram and hardware authorization instructions for MegVII face chip
1.1.4	2023-06-25	Updated Bluetooth support for BT v5.2

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1 RK3399 Brief

RK3399 chip with high performance, high scalability, characteristics, hardware specifications and price in the industry in a leading position.

1.1 Super size core CPU architecture + Super Mali-T860MP4 GPU

The CPU of RK3399 adopts big.LITTLE size core architecture, dual Cortex-A72 large core + four Cortex-A53 small core structure, which is greatly optimized for integer, floating point, memory, etc., and has revolutionary improvement in overall performance, power consumption and core area. The RK3399 GPU uses quad-core ARM's new generation of high-end image processor Mali-T860, integrating more bandwidth compression technology: such as intelligent stacking, ASTC, local pixel storage, etc., but also supports more graphics and computing interfaces, the overall performance is 45% higher than the previous generation.

1.2 RK3399 Super Seven performance benefits

Not only more advanced in CPU and GPU, the RK3399 processor also has the following exclusive advantages:

- 1) Integrate two USB3.0 Type-C interfaces, support Type-C Display Port audio and video output.
- 2) Dual ISP pixel processing capacity up to 800MPix/s, support dual camera data input at the same time, support 3D, depth information extraction and other high-level processing.
- 3) MIPI/eDP interface, support 2560×1600 screen display and dual screen display.
- 4) HDMI2.0 interface, H.265/H.264/VP9 4K@60fps HD video decoding and display.
- 5) Built-in PCI-e interface to support high-speed Wi-Fi and storage expansion based on PCI-e.
- 6) Support 8-channel digital microphone array input.
- 7) Comprehensive system support: compatible with Android, Linux and other operating systems.

1.3 Strong compatibility and expansion ability can be applied to VR, game box, tablet and other intelligent terminals

For VR smart devices: The RK3399 has the hardware advantages of 20ms delay, 90Hz refresh rate, 4K UHD decoding, 2K Low Persistence screen, high-precision positioning and tracking system, super HDR camera technology, super 3D processing power, and ultra HD H.265/H.264 video resolution.

For tablets and game boxes: RK3399 relies on a powerful CPU, CPU and faster interface standards, transmission speed, support H.265/VP9 encoding 4K@60fps10bit video playback and output capabilities,

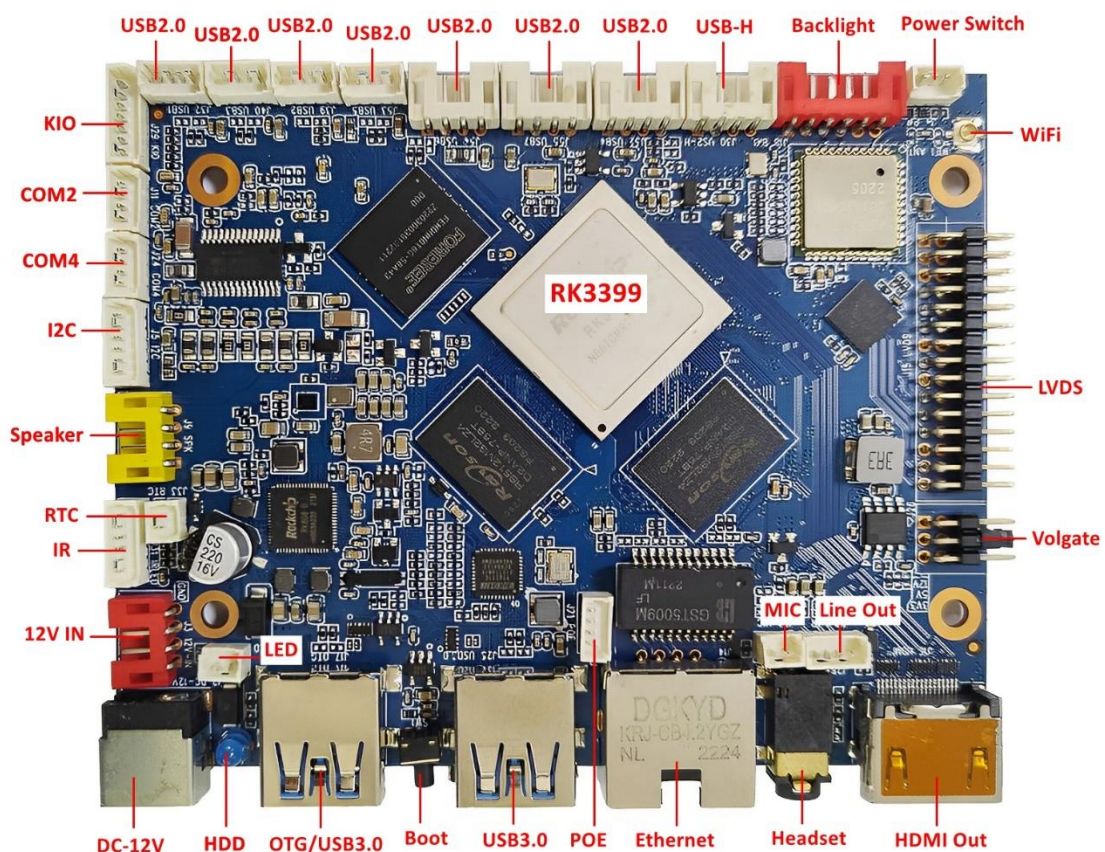
better image decoding, rich game engine and 3D image processing capabilities, to provide faster computing speed and visual effects for the terminal. In addition to tablet PC, VR, TV-BOX, notebook, car machine, communication field, RK3399 with rich scalability can be applied to cover all kinds of terminals in industrial and consumer fields, including smart home appliances, advertising machine/all-in-one machine, financial POS machine, vehicle control terminal, thin client, VOIP video conferencing, security/monitoring/police and IoT Internet of Things field.

2 Product Overview

H-3399 mainboard is based on Rockchip RK3399 high-performance application processor platform. RK3399 is a low power, high performance processor for computing, personal mobile internet devices and other smart device applications. Based on Big.Little architecture, it integrates dual-core Cortex-A72 and quad-core Cortex-A53 with separate NEON coprocessor, clocked at up to 1.8GHz, with superior computing performance, 2D/3D graphics processing capabilities and Full HD video codec capabilities. It perfectly supports 4Kx2K@60fps decoding and 4Kx2K HDMI 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-3399 V4.0 mainboard actual interface diagram as shown below.



3 Specification List

H-3399's system functions and interface features are shown in the following table.

Function & Interface	Detailed Description
CPU	RK3399 Cortex-A72 dual-core and Cortex-A53 quad-core, up to 1.8GHz
DDR	LPDDR4 2GB (4GB 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
HDMI Output	HDMI 2.0a standard display interface supports up to 4K output
MIPI-DSI Output	31-Pin common MIPI DSI interface for extended MIPI panel sub-board
EDP	30-pin common FPC EDP supporting 1~2 lanes format up to 1080P output
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 3.0 connectors (Single Socket, one is for OTG), 8 pin headers (one is CPU original USB)
Serial Port	2 TTL/RS-232 compatible
Micro SD Card	Self-elastic micro SD card socket, up to 256GB capacity
USB Camera	Support USB camera within 5 million pixels
WiFi	Built-in high performance SDIO interface WiFi module, support IEEE 802.11 b/g/n/ac. The default single frequency is 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 v4.0/BT v5.2
Ethernet	10/100/1000M Adaptive Ethernet RJ45 connector
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 7.1, Android 8.1/9.0 and Linux Buildroot/Debian 9/Ubuntu-18.04 optional
Face Authorization	Support for Megvii face chip

4 Interface definition

➤ J1 TF Card Socket

[J1] Standard TF Card Socket.

➤ J2 DC-12V Socket

[J2] 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

➤ J4 Power Switch & Reset Header

[J4] 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

➤ J5 I2C Bus Header

[J5] 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 signal
4	SCL	I2C Bus clock signal
5	RST	Mainboard reset output (3.3V level)

6	3V3	Power output supply 3.3V
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➤ J6 LED Power Switch

[J6] LED Power Switch (SIP 1.25mm-Square pad is pin 1).

Pin#	Definition	Note
1	GND	Power Ground
2	12V	12V Switch Power Output (IO #133)

➤ J9 Speaker Header

[J9] 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 +

➤ J11 Data Serial Port 2

[J11] Built-in Serial Port 2 (SIP 1.25mm-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 U62 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)

Note: If you need to use the built-in serial port 2 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).

➤ J14 Ethernet RJ45 Jack

[J14] RJ45 Gigabit Ethernet Jack (Standard jack).

➤ J15 LVDS Header

[J15] Dual LVDS header [DIP 2.0mm-Square pad is pin 1].

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+

➤ J16 HDMI Jack

[J16] HDMI 2.0 Jack (Standard jack).

➤ J17 USB 3.0 OTG Type A

[J17] USB 3.0 OTG Horizontal Type A Jack (Standard jack).

Note: This interface receives internal TYPEC0 3.0 USB/OTG signal, and defaults to firmware burning port at power-on moment, which can be connected to PC for software burning; After entering Android, you can set it to USB ADB debugging port or common USB Host port through the software.

➤ J18 Backlight Control Header

[J18] 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

➤ J19 Audio Line Output

[J19] Audio Line Output (SIP 1.25mm-Square pad is pin 1).

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

➤ J20 Mic Input Header

[J20] Audio Input Header (SIP 1.25mm-Square pad is pin 1).

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

➤ J21 POE PD Header

[J21] 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 for the POE receiver port comes from the J14 Ethernet port. This port is connected to the external POE receiver board for 12V power supply conversion. The current of the 12V power supply depends on the power supply capability of the POE switch and the conversion capability of the conversion board. This port supports a POE power supply device with 1/2 positive and 3/6 negative cables, or a POE power supply device with 4/5 positive and 7/8 negative cables.

➤ J23 MIPI Output Header

[J23] MIPI Panel FPC Connector (FPC-0.3mm 31-Pin **Top/Bottom** Contact).

Pin#	Definition	Note
1	LED+	LED Anode
2	LED+	LED Anode
3	LED+	LED Anode
4	NC	Not Connected
5	LED-	LED Cathode
6	LED-	LED Cathode
7	LED-	LED Cathode
8	LED-	LED Cathode
9	GND	Digital Ground
10	GND	Digital Ground
11	MIPI_D2P	+MIPI differential lane2
12	MIPI_D2N	-MIPI differential lane2
13	GND	Digital Ground
14	MIPI_D1P	+MIPI differential lane1
15	MIPI_D1N	-MIPI differential lane1
16	GND	Digital Ground
17	MIPI_CKP	+MIPI differential clock output
18	MIPI_CKN	-MIPI differential clock output
19	GND	Digital Ground
20	MIPI_D0P	+MIPI differential lane0
21	MIPI_D0N	-MIPI differential lane0
22	GND	Digital Ground
23	MIPI_D3P	+MIPI differential lane3
24	MIPI_D3N	-MIPI differential lane3
25	GND	Digital Ground
26	VDD-1V8	Power Supply 1.8V (Default is not connected, need to weld R9232 0R)
27	RESET	Reset Signal in 1.8V
28	GND	Digital Ground
29	VDD-1V8	Power Supply 1.8V
30	VDD-3V3	Power Supply 3.3V
31	VDD-3V3	Power Supply 3.3V

➤ J24 Data Serial Port 4

[J24] Built-in Serial Port 4 (SIP 1.25mm-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 U62 mounted). **The related software device node name is ttyS4.**

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)

➤ J25 USB 3.0 Host Type A

[J25] USB 3.0 Host Horizontal Type A Jack (Standard jack).

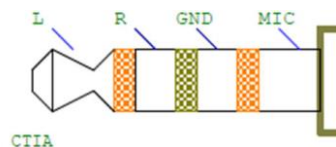
Note: This interface is connected to the internal TYPEC1 USB signal, which is a high-speed direct USB 3.0 Host interface.

➤ J26 LVDS Voltage Header

[J26] LVDS Voltage Header (DIP 2.0mm-Square pad is pin 1). If pin 1 and 2 are jumper shorted, the VLCD of J15 is 12V. If pin 3 and 4 are jumper shorted, the VLCD of J15 is 5V. If pin 5 and 6 are jumper shorted, the VLCD of J15 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.

➤ 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 KIO Keypad Header

[J29] 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 #42)
3	K2	K2 (Regular GPIO #47)
4	K3	K3 (Regular GPIO #48)
5	K4	K4 (Regular GPIO #49)
6	K5	K5 (Regular GPIO #50)
7	GND	Digital Ground

Note: All KIO signals can be adjusted to regular GPIO via a separated software version (level is 3.3V); by default K1 Volume+/K2 Volume-/K3 Standby/K4 Exit/K5 Home.

➤ J30 USB 2.0 Host Header

[J30] 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 port is the internal Host0 port of the CPU. High-speed devices such as USB 2.0 cameras are recommended to use this independent port.

➤ J31 Remote Control & LED Header

[J31] Remote Control & LED Header (SIP 1.25mm-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

➤ J32 USB 2.0 Host Header

[J32] USB 2.0 Host Header (SIP 1.25mm-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

注意: 该 USB 接口连接到 Host1 的 1x7 Hub 组。

➤ J33 RTC Battery Header

[J33] 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

➤ J34 eDP Output FPC Header

[J34] eDP Panel FPC Connector (FPC-0.5mm 30-Pin **Bottom Contact**).

Pin#	Definition	Note
1	NC	Not Connected
2	GND	Digital Ground
3	EDP_TX1N	TX1- differential output
4	EDP_TX1P	TX1+ differential output
5	GND	Digital Ground
6	EDP_TX0N	TX0- differential output
7	EDP_TX0P	TX0+ differential output
8	GND	Digital Ground
9	EDP_AUXP	AUX+ differential channel
10	EDP_AUXN	AUX- differential channel
11	GND	Digital Ground
12	LCD_VCC	Logic Power (3.3V or 5V)
13	LCD_VCC	Logic Power (3.3V or 5V)
14	NC	Not Connected
15	GND	Digital Ground
16	GND	Digital Ground
17	NC	Not Connected
18	BL_GND	Backlight LED Ground
19	BL_GND	Backlight LED Ground
20	BL_GND	Backlight LED Ground
21	BL_GND	Backlight LED Ground
22	BL_EN	Backlight Enable
23	BL_PWM	PWM Backlight Brightness PWM
24	NC	Not Connected
25	NC	Not Connected
26	BL_POWER	Backlight Power (12V)
27	BL_POWER	Backlight Power (12V)
28	BL_POWER	Backlight Power (12V)
29	BL_POWER	Backlight Power (12V)
30	NC	Not Connected

➤ J39 USB 2.0 Host Header

[J39] USB 2.0 Host Header (SIP 1.25mm-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 port is connected to Host1's 1x7 Hub group.

➤ J40 USB 2.0 Host Header

[J40] USB 2.0 Host Header (SIP 1.25mm-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 port is connected to Host1's 1x7 Hub group.

➤ J52 USB 2.0 Host Header

[J52] 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 port is connected to Host1's 1x7 Hub group.

➤ J53 USB 2.0 Host Header

[J53] USB 2.0 Host Header (SIP 1.25mm-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
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Note: This USB port is connected to Host1's 1x7 Hub group.

➤ J54 USB 2.0 Host Header

[J54] 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 port is connected to Host1's 1x7 Hub group.

➤ J55 USB 2.0 Host Header

[J55] 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 port is connected to Host1's 1x7 Hub group.

➤ ANT WiFi Antenna IPEX

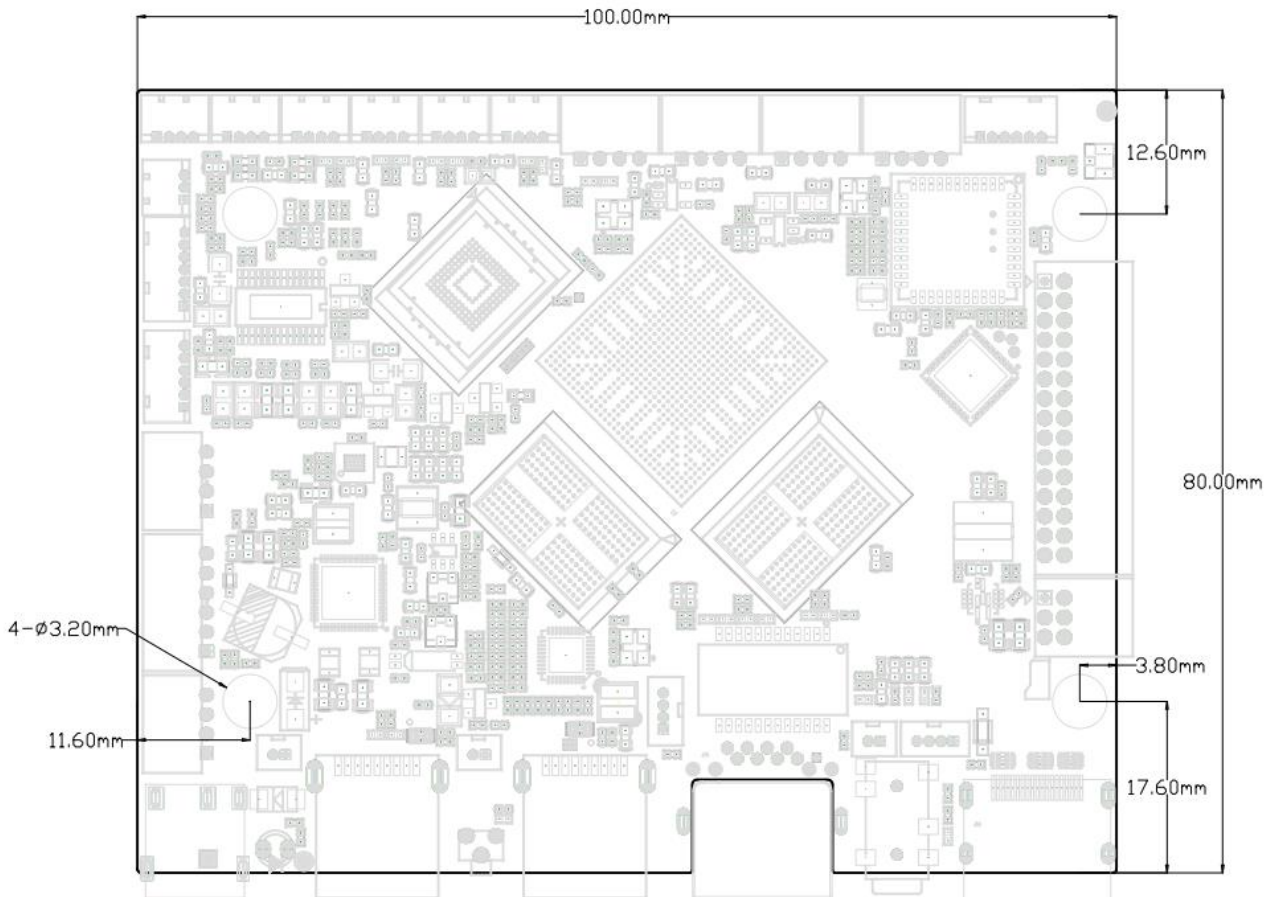
[ANT] Standard IPEX antenna connector (Φ2.0mm).

➤ 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.

5 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.



6 Assemble Precautions

Please note the following key points when using the H-3399 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.
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.
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.

7 Software Guide

H-3399 motherboard supports LVDS/eDP/HDMI any two output dual screen display combination, does not support LVDS and MIPI display combination! For related output combinations, consult the manufacturer to provide corresponding abnormal patches.

The software port numbers of the serial ports and expansion serial ports on the H-3399 mainboard are as follows:

Port	Software Device Node
J11	/dev/ttyS2
J24	/dev/ttyS4