Hi3861 V100 / Hi3861L V100 Demo Board

User Guide

Issue 02

Date 2020-05-19

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About This Document

Purpose

This document describes the details of the Hi3861 V100/Hi3861L V100 IoT module and demo board, and provides FAQs and troubleshooting steps.

Related Versions

The following table lists the product versions related to this document.

Product Name	Version
Hi3861	V100
Hi3861L	V100

Intended Audience

The document is intended for:

- PCB hardware development engineers
- Software engineers
- Technical support engineers

Symbol Conventions

The following table describes the symbols that may be found in this document.

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

Symbol	Description
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
🕮 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Date	Change Description
02	2020-05-19	In **2.1 Layout**, the description of the Hi3861 V100 and Hi3861L V100 demo board and module is added.
01	2020-04-30	This issue is the first official release. • In **Table 2-2** of **2.2.2 10-Pin Connectors**, the function description of pin 9 is updated.
00B02	2020-04-10	**4.3 UART Port Configuration of the Demo Board** is added.
00B01	2020-01-15	This issue is the first draft release.

Contents

1 Introduction

The Hi3861/Hi3861L IoT module is a product board with reference design provides for customers to develop IoT modules. HI1131HEVA005&007 is the demo board used in conjunction with the IoT module. These two boards are identical using the same schematic diagram except the differences in PCB silkscreen.

The module provides the following functions:

- Onboard antenna and external antenna of the IPEX connector
- Ejector calibration testing in production line
- Two serial ports, with one for maintenance, testing, and firmware download and upgrade purposes, and the other for communication with the host
- Five GPIOs for PWM

The demo board provides the following functions:

- 5 V USB power supply and USB-to-serial communication
- RS232 serial port debugging
- A power-on reset (POR) button and reserved external buttons
- Two GPIO LEDs
- Connection to a 1-to-10 mainboard for testing purposes

2 Demo Board Functions and Layout

This chapter describes the system block diagram and layout of the demo board, as well as the functions of the main modules of the system.

2.1 Layout

Figure 2-1 shows the layout of the following main devices on the mother board. **Table 2-1** describes the device details. **Figure 2-2** shows the demo board and module of Hi3861L V100, which are the same as those of Hi3861 V100, except for the PCB silkscreens.

- Key module (Hi3861)
- Power supply port
- Buttons and LEDs
- UART port

Figure 2-1 Hi1131HEVA005&007 layout

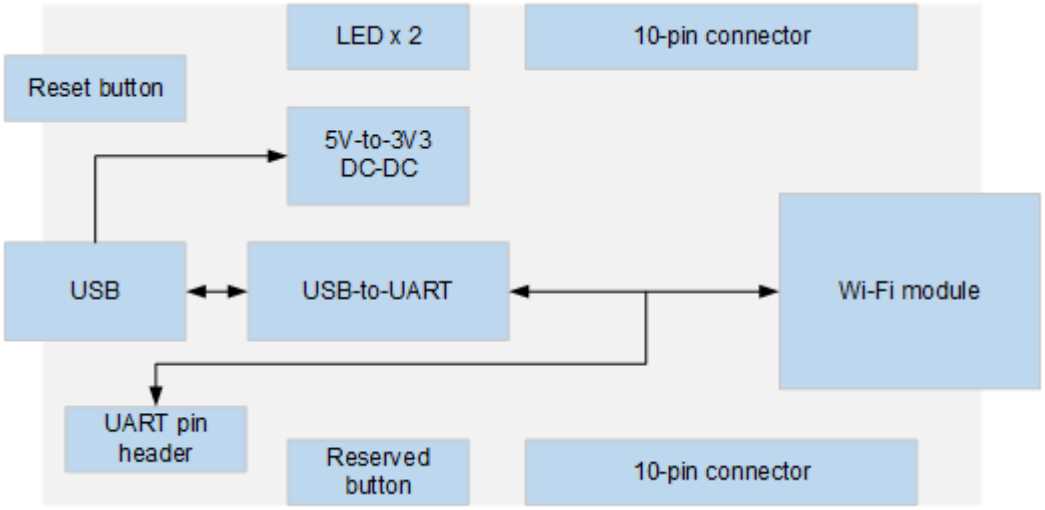


Figure 2-2 Hi3861L V100 demo board and module

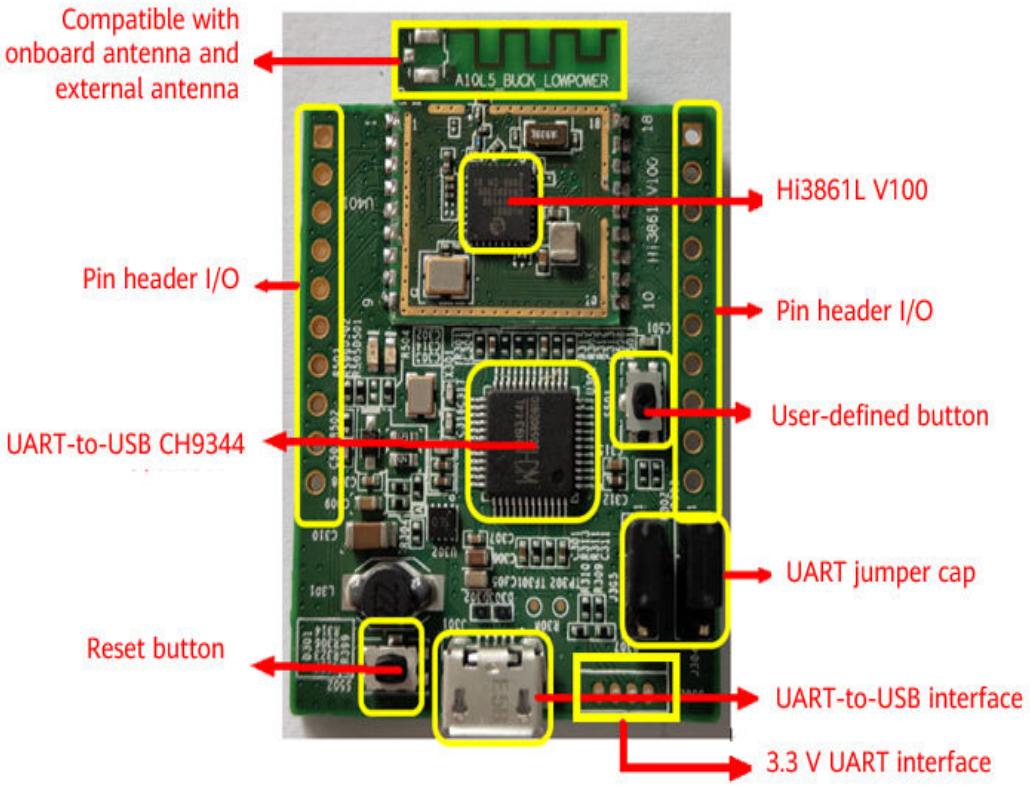


Table 2-1 Main devices on the demo board

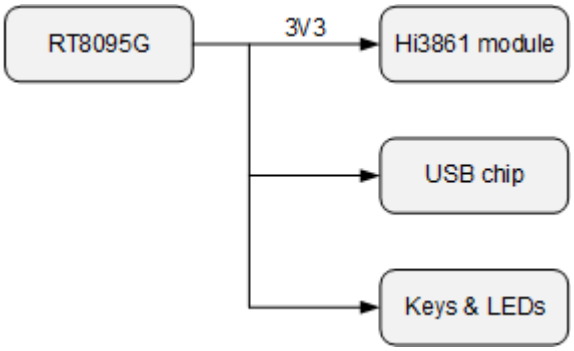
Device	Description	Function
Hi3861/ Hi3861L IoT module	Wi-Fi module	Functional tests
DC-DC chip	Switching Regulators-Buck-RT8095-Richtek	Power supply
USB-to-UART converter	USB-to-four UARTs (CH9344)	Serial communication
30 MHz crystal	Crystal resonator-30 MHz-15 pF-±10 ppm-50 ohms-2.5 x 2.0 x 0.5	Clock signal source for the USB chip

2.2 Component Description

2.2.1 Power Supply

The general supply of the board is 5 V, 1 A input over the USB port. Specifically, the DC-DC module converts the supply to 3.3 V required by the board and the module. **Figure 2-3** shows the power tree of the demo board.

Figure 2-3 Power tree of the demo board



2.2.2 10-Pin Connectors

The two 10-pin connectors J501 and J502 are used to connect to the 1-to-10 main board (HI1131HTST03).

Table 2-2 Pin arrangement of the 10-pin connectors on the demo board (GPIO pins operate at 3.3 V)

J501 Pin No.	Pin Function	J502 Pin No.	Pin Function
1	3V3	1	Log printing RX
2	EN	2	Log printing TX
3	PWM0	3	Request to send (RTS) for serial communication
4	PWM1	4	Clear to send (CTS) for serial communication
5	PWM2	5	Serial communication TX
6	PWM3	6	Serial communication RX
7	NC	7	NC
8	PWM4	8	GND
9	Reserved download enable signal	9	NC

J501 Pin No.	Pin Function	J502 Pin No.	Pin Function
10	External 5 V	10	NC

Figure 2-4 10-pin connectors of the demo board

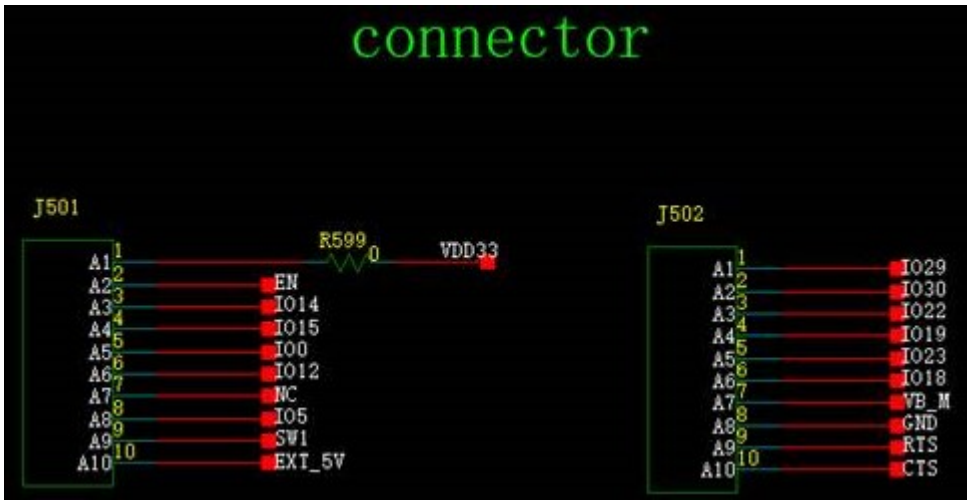
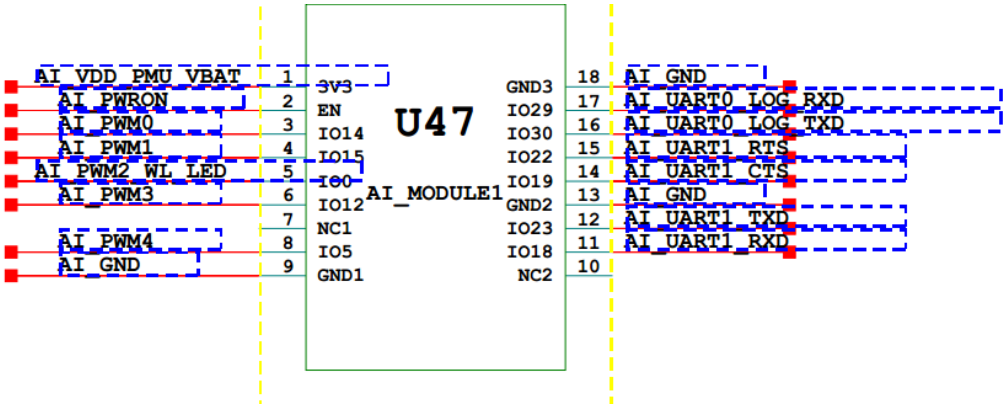


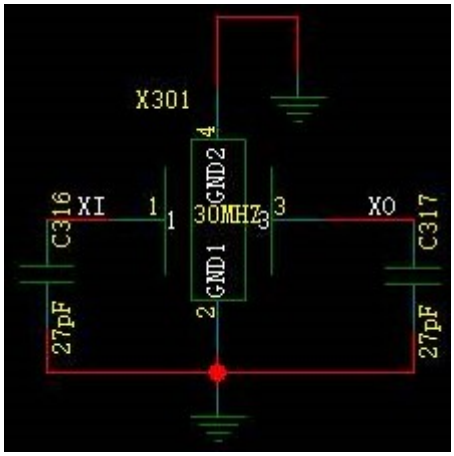
Figure 2-5 Pin map of the IoT module



2.2.3 Clock

HI1131HEVA005&007 operates at a clock rate of 30 MHz, which is a generated by an external crystal. **Figure 2-6** shows the clock circuit.

Figure 2-6 Clock circuit of the demo board



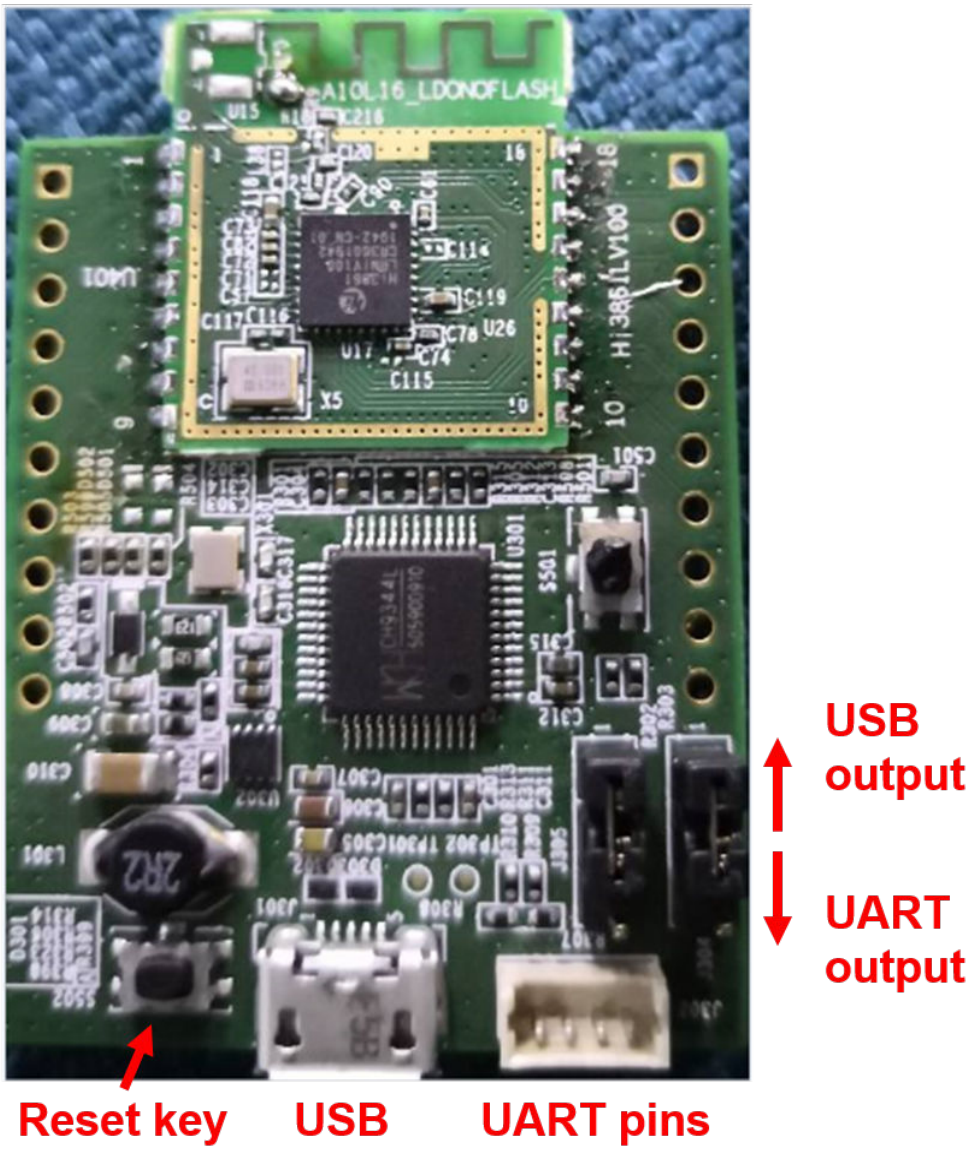
2.2.4 UART Debugging

The USB port provides 5 V power supply, in addition to serial port communication using a USB to 4-channel UART convertor. On the board, the two serial ports of the module are routed to the USB port, as shown in **Table 2-3** and **Figure 2-7**. As long as the USB port is connected to that of a PCB or power adapter, 5 V supply is input. The module selects the UART signal transmission path from J304 and J305, as shown in **Figure 2-7**. When the jumper cap is connected between J304 and J305 via pins close to the module, the UART port for module download and upgrade is connected to the USB port. When the jumper cap is connected between J304 and J305 via pins close to J302, the UART port for module download and upgrade is connected to the UART pins.

Table 2-3 USB port on the demo board

USB UART Port	UART Purpose
USB CH A	Serial communication of the Wi-Fi chip (4-wire)
USB CH B	Log printing and firmware downloading of the Wi-Fi chip (2-wire)

Figure 2-7 Diagram of the demo board



2.3 Keys and LEDs

Table 2-4 and Table 2-5 describe the LEDs and keys on the HI1131HEVA005&007 demo board, respectively.

NOTE

For details about the LEDs, see Table 2-4 and the silkscreen.

Table 2-4 LEDs on the HI1131HEVA005&007 demo board

LED RefDes	Description
D501	Blue, GPIO, connected to PWM0 of the module, active low

LED RefDes	Description
D502	Yellow green, GPIO, connected to PWM1 of the module, active low

Table 2-5 Keys on the HI1131HEVA005&007 demo board

Key RefDes	Description
S501	Reserved key for download and upgrade, connected to the UART1_Rx pin of the chip
S502	Reset key, connected to the EN pin of the module

3 IoT Module Functions and Layout

This chapter describes the system block diagram and layout of the IoT module, as well as the functions of the main modules of the system.

3.1 Module Layout

Figure 3-1 and **Figure 3-2** show the layout of the following main devices of the module.

- Onboard antenna and connector for external antenna
- Crystal of the clock

Figure 3-1 Hi3861 V100 IoT module layout

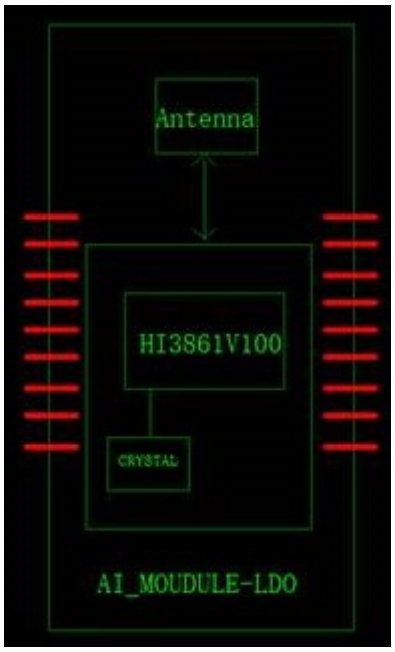


Figure 3-2 Hi3861L V100 IoT module layout

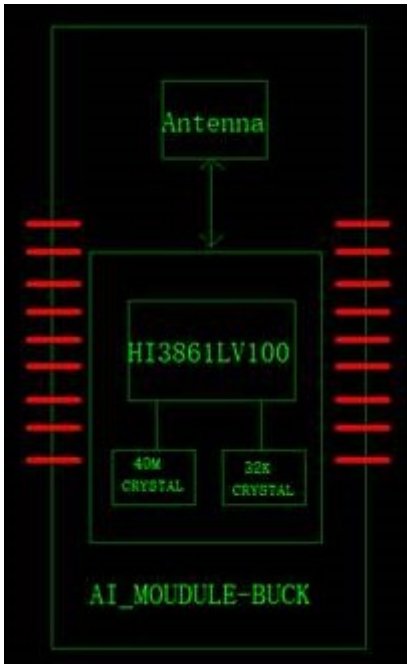


Table 3-1 Main devices of the IoT module

Device	Description	Function
Hi3861 or Hi3861L chip	Wi-Fi chip	Functional tests
40 MHz crystal	40 MHz, 15 pF, 25 ohms crystal resonator with a tolerance of ±10 ppm (SMD3225)	40 MHz clock source
32 kHz crystal	0.032768 MHz, 12.5 pF, 70000 ohms crystal resonator with a tolerance of ±20 ppm (SMD3215)	32 kHz clock source

3.2 Pin Arrangement

In the antenna block of the module, the white silkscreen indicates the IP hardware version, as shown in **Figure 3-3**. The silkscreen prefix (for example, A10L14) identifies the hardware version. **Table 3-2** and **Table 3-3** describe the pin arrangement.

Figure 3-3 IoT module

Table 3-2 Module pin arrangement (prefixed with A10L1, A10L5, A10L6, A10L7, A10L8, A10L13, or A10L14)

Module Pin No.	Module Pin Name	Chip Pin No.	Chip Pin Function
1	3V3	-	-
2	EN	22	PWRON
3	PWM0	27	GPIO9
4	PWM1	28	GPIO10
5	PWM2	29	GPIO11
6	PWM3	30	GPIO12
7	NC	-	-
8	PWM4	31	GPIO13
9	GND	-	-
10	NC	-	-
11	UART1_RX	17	GPIO5
12	UART1_TX	18	GPIO6
13	GND	-	-
14	UART1_CTS	19	GPIO7
15	UART1_RTS	20	GPIO8
16	UART0_TX	5	GPIO3
17	UART0_RX	6	GPIO4

Module Pin No.	Module Pin Name	Chip Pin No.	Chip Pin Function
18	GND	-	-

NOTE

- For the module prefixed with A10L1, A10L5, A10L6, or A10L14, the GPIO pins that are not routed to the module pins are unavailable, for example, GPIO2 and GPIO14. Set them to the input state or high impedance state in software.
- For the module prefixed with A10L7, A10L8, or A10L13, the GPIO pins that are not routed to the module pins are unavailable, for example, GPIO0–2 and GPIO14. Set them to the high impedance state in software.

Table 3-3 Module pin arrangement (prefixed with A10L3 or A10L16)

Module Pin No.	Module Pin Name	Chip Pin No.	Chip Pin Function
1	3V3	-	-
2	EN	22	PWRON
3	PWM0	27	GPIO9
4	PWM1	28	GPIO10
5	PWM2	2	GPIO0
6	PWM3	3	GPIO1
7	NC	-	-
8	PWM4	4	GPIO2
9	GND	-	-
10	NC	-	-
11	UART1_RX	17	GPIO5
12	UART1_TX	18	GPIO6
13	GND	-	-
14	UART1_CTS	19	GPIO7
15	UART1_RTS	20	GPIO8
16	UART0_TX	5	GPIO3
17	UART0_RX	6	GPIO4
18	GND	-	-

NOTE

For the module prefixed with A10L3 or A10L16, the GPIO pins that are not routed to the module pins are unavailable, for example, GPIO11–14. Set them to the input state or high impedance state in software.

3.3 Component Description

3.3.1 Clock

Hi3861 operates at a clock rate of 40 MHz, which is a generated by an external crystal. The 32 kHz clock of Hi3861L V100 is also generated by an external crystal. **Figure 3-4** and **Figure 3-5** show the clock circuits.

Figure 3-4 40 MHz crystal circuit

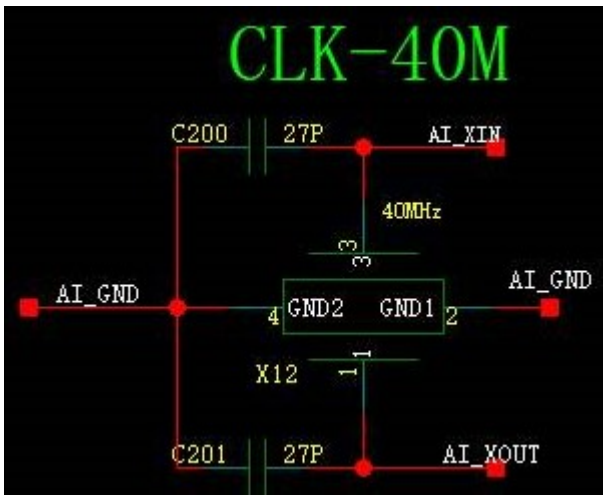
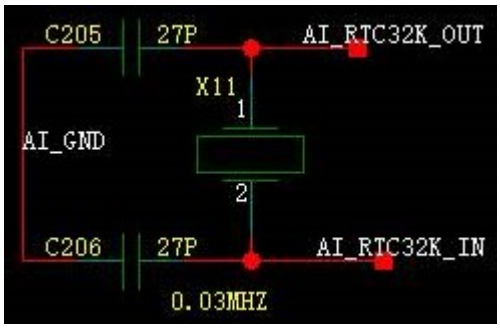


Figure 3-5 32 kHz crystal circuit



3.3.2 RF Port

The module provides two Wi-Fi test schemes:

- Onboard IPEX connector conduction test
- Onboard antenna radiation test

To test with an external antenna or the onboard antenna, you need to modify the board hardware by following the description in **Table 3-4**, **Figure 3-6**, and **Figure 3-7**.

Table 3-4 Modification for conduction test using onboard or external antenna

RF Test Mode	RefDes	Description
IPEX connector conduction test	J1, J9, J10, J22, J43	To use the IPEX connector, solder a 0 ohm resistor at R3, R8, R18, R34, or R19 and remove the matching capacitors of the antenna.
Onboard antenna radiation test	-	To test with the onboard antenna, remove the 0 ohm resistor and IPEX connector, and install the matching capacitors of the antenna.

Figure 3-6 IPEX connector conduction test scheme

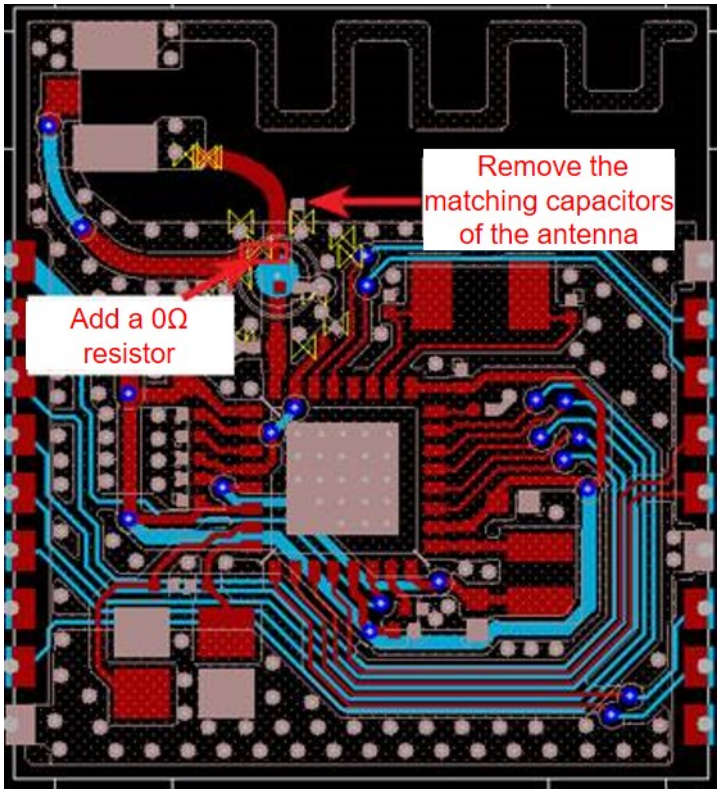
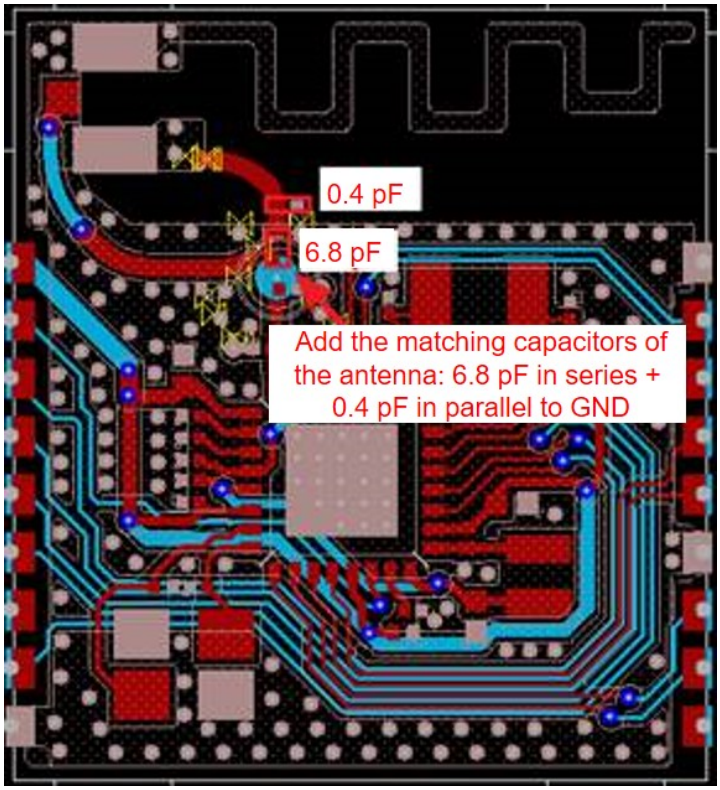


Figure 3-7 Onboard antenna test scheme

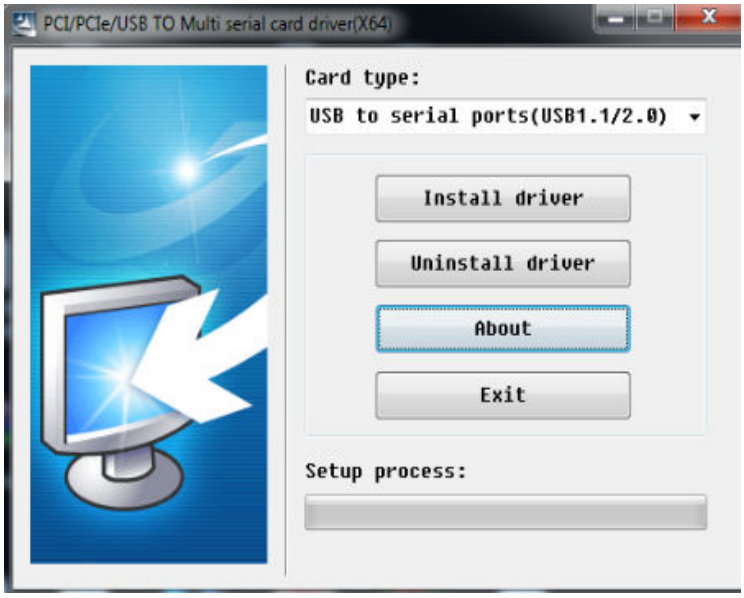


4 Installing USB-to-UART Driver and Connecting to the Demo Board

4.1 Installing USB-to-UART Driver

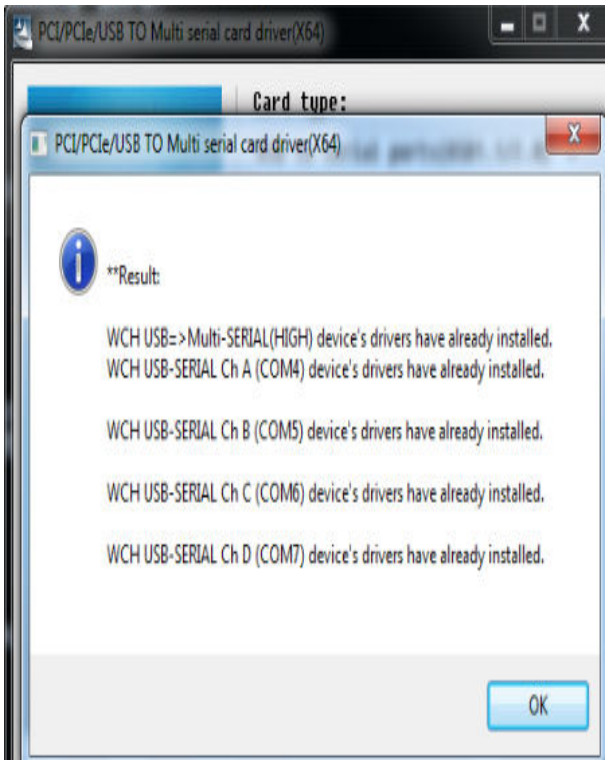
Step 1 Connect the PC and the board over the USB port. The board is supposed to be powered on. Open the driver installation package decompressed from **USBMSER.rar**, and click **Install driver**.

Figure 4-1 Driver installation



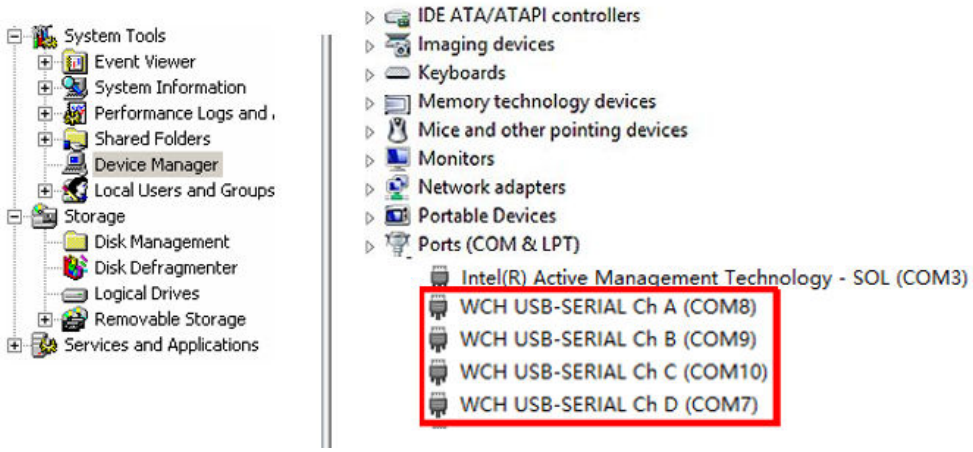
Step 2 Wait until the driver installation is complete.

Figure 4-2 Driver installation completed



Step 3 Open the **Device Manager** dialog box and expand the **Ports** section. If four new ports shown in **Figure 4-3** are added to the list, the driver is installed successfully.

Figure 4-3 Viewing new ports

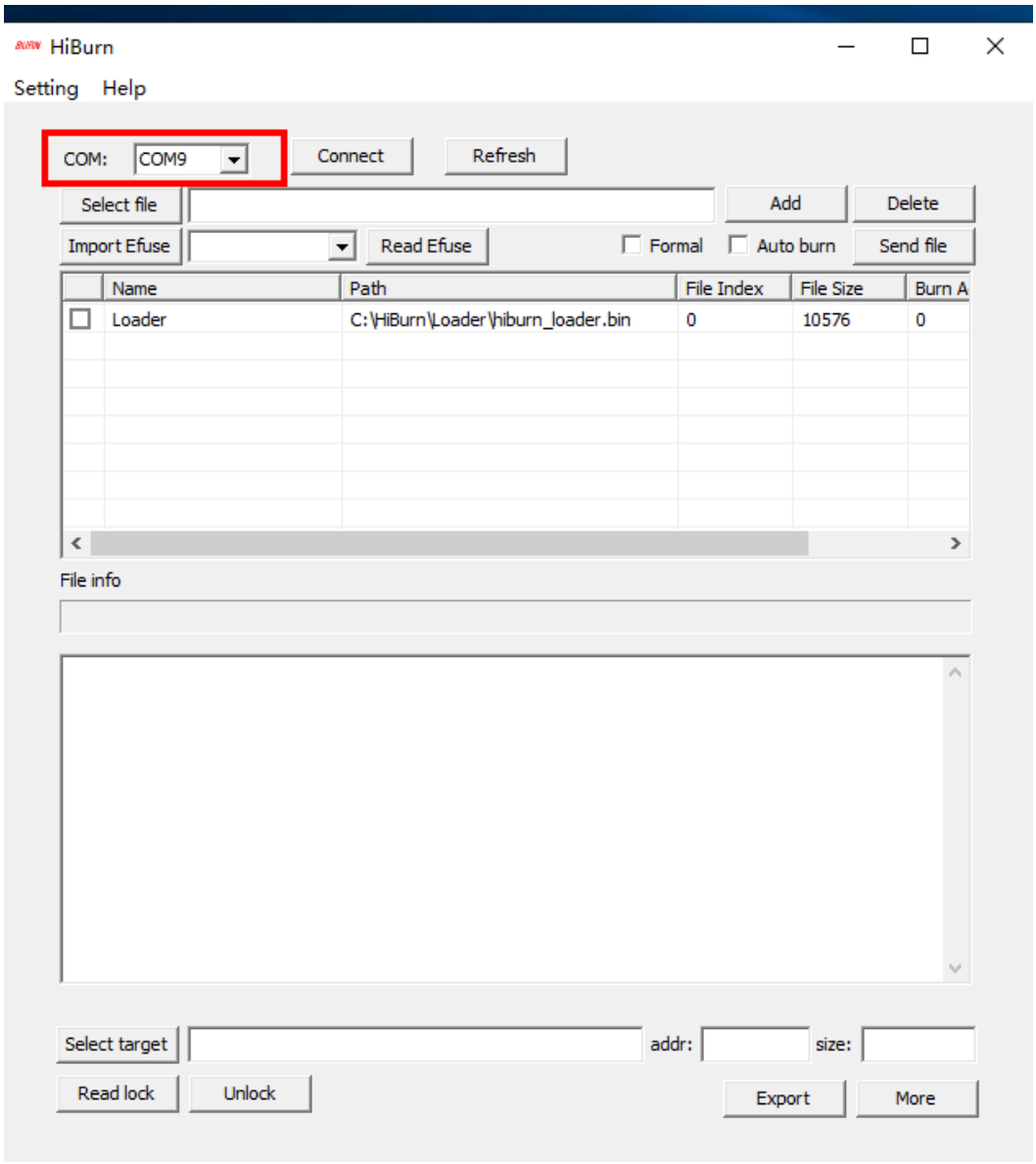


----End

4.2 Connecting to the Demo Board

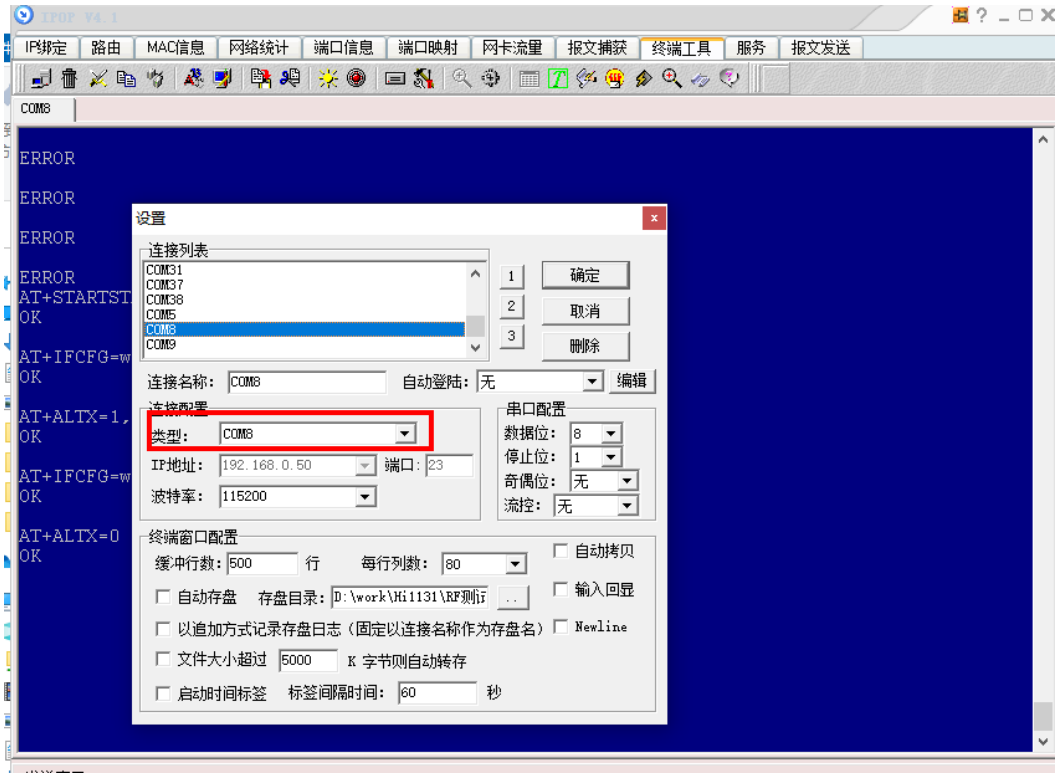
In the tool for program burning and log printing, select the CH B port (**COM9**), as shown in **Figure 4-4**.

Figure 4-4 Connecting to the demo board - 1



In the tool for UART communication, select the CH A port (**COM8**), as shown in **Figure 4-5**.

Figure 4-5 Connecting to the demo board - 2



4.3 UART Port Configuration of the Demo Board

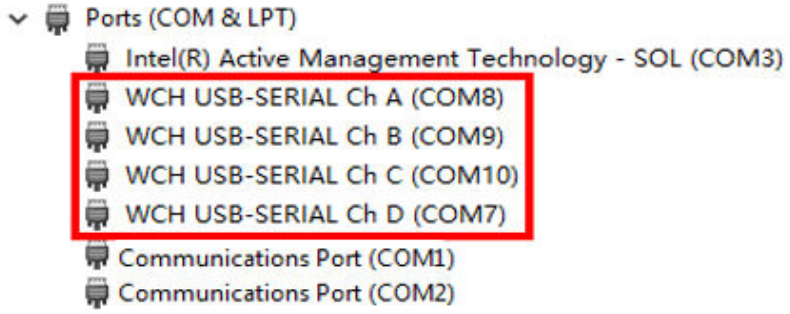
4.3.1 Default UART Port Configuration of the Demo Board

By default, the chip supports three UART ports. The default function configuration of each UART port is as follows:

- UART0: serial port used for burning binary files, HiStudio tool (HSO), or shell command (The HSO tool and shell command are selected from the **app_main** file by the user.)
- UART1: serial port used by AT commands
- UART2: serial port used for WFA authentication

Choose **Device Manager** > **Port** to view the ports, as shown in **Figure 4-6**.

Figure 4-6 Viewing the ports



The UART ports of the demo board are as follows:

- UART0: Ch B
- UART1: Ch A
- UART2: not led out from the board currently. It needs to be connected to the DB-9 serial port by using a jump wire.

4.3.2 Modifying the UART Port Configuration of the Demo Board

In case that the default UART port configuration does not match the actual hardware design or application scenario, the SDK allows you to modify the default UART port configuration. The modification methods are as follows:

- Modify the NV XML file.
- Modify configurations by using AT commands.

4.3.2.1 Modifying the NV XML File

Step 1 Open the NV configuration file.

The NV configuration file is the XML file in the SDK code directory (**tools/nvtool/xml_file/**), as shown in **Figure 4-7**.

Figure 4-7 NV file directories

Step 2 Modify **PARAM_VALUE** of the NV item whose NV ID is **0x42** (as shown in **Figure 4-8**) based on the requirements of the NV configuration port.

Figure 4-8 Example of the NV item with the NV ID of 0x42

```
<NV ID="0x42" NAME="HI_NV_SYS_UART_ALLOC" PARAM_NAME="hi_nv_uart_port_alloc" PARAM_VALUE="{1,0,2,0}" CATEGORY="BSP"  DEV="CCO-STA-NDM" BROADCAST="1" DESCRIPTION="" />
```

The first three arguments in **PARAM_VALUE** correspond to the AT command UART port, debugging UART port, and WFA authentication UART port. The default values are **1**, **0**, and **2** respectively. The fourth argument is set to the default value **0**.

For details about how to use NV, see the *Hi3861 V100/Hi3861L V100 NV User Guide*.

----End

Take UART2 for AT commands and UART0 for debugging as an example. To modify the NV configuration, perform the following steps:

Step 1 Change the NV configuration item to **PARAM_VALUE="{2,0,1,0}"**.

Step 2 Recompile the code to generate the firmware program.

----End

4.3.2.2 Modifying configurations by Using AT Commands

You can run the **AT+SETUART** command to set the UART port. For details, see the *Hi3861 V100/Hi3861L V100 AT Commands User Guide*.

[Application scenario sample]

In a certain phase of the production test, only UART0 is available due to the hardware environment restriction. In this case, you can use the AT command as follows:

Step 1 When compiling the firmware program, modify the NV configuration according to **4.3.2.1 Modifying the NV XML File** to set UART0 for the AT command, that is, **PARAM_VALUE="{0,1,2,0}"**.

Step 2 After this phase of the production test is complete, run the AT command to change the AT command UART port back to UART1. The change takes effect after the system is restarted. Then, continue the function tests of subsequent phases.

----End

5 Precautions

HI1131HEVA005&007 applies to the lab or field testing. To avoid board damage, pay attention to the following points:

- The board must be horizontally placed on an anti-static platform with the top layer facing upward. Ensure that no conductive objects especially tweezers, probes, solders, screws, or jumper caps are placed under the board.
- Wear anti-static gloves or grounding wrists when operating the board.
- Never crash or scratch the board with sharp objects to avoid any damage to the board or devices.
- Never touch the DC-DC converter to avoid any body injury due to high temperature. Never connect the grounding end of the oscilloscope in the power supply area. Otherwise, the grounding end may fall onto the power supply, causing damage to the board.
- Before installing the USB-to-UART driver, the board should have been connected to the PC. Otherwise, the driver installation may be suspended. In this case, restart the PC, check the connection, and try again.