

RHF76-052

RHF76-052 Hardware Design Guide

V0.1

Document information

Info	Content
Keywords	<i>Ai-Thinker, RHF76-052, UART, Modem, Upgrade, Hardware, Reference design</i>
Abstract	This document is a description for HW of RHF76-052 UART modem.

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تهیه و توزیع قطعات الکترونیک

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1 Introduction

Ai-Thinker™ LoRaWAN™ UART modem RHF76-052 is LoRaWAN compatible device, supports LoRaWAN communication. These two modems are based on the RHF76-052 module and an embedded LoRaWAN stack. Customer could use a host MCU to control this modem with simple AT command. The advanced and simple command interface offers rapid time to market.

This document is targeted to help customer to set their hardware platform quickly with RHF76-052 UART modem. The only difference between the two modems is the boot loader interface. RHF76-052 use UART bootloader for firmware upgrade.

RHF76-052 — UART AT command, UART bootloader

2 GPIO Definition

Table 2-1 GPIO description

Number	Name	Type	Description and application
1	VCC	-	Supply voltage for the module
2	GND	-	Ground
3	PA8	I/O	GPIO_PA8 ⁽²⁾
4	PA9	I/O	GPIO_PA9; UART1_TX of Modem for Firmware upgrade(RHF76-052)
5	PA10	I/O	GPIO_PA10; UART1_RX of Modem for Firmware upgrade(RHF76-052)
6	NSS	I/O	GPIO_PB12
7	SCK	I/O	GPIO_PB13
8	MISO	I/O	GPIO_PB14
9	MOSI	I/O	GPIO_PB15
10	USART1_CTS	I/O	USART1_CTS ⁽¹⁾ from MCU; GPIO_PA11; USB_DM for Firmware upgrade(RHF76-052AN)
11	USART1_RTS	I/O	USART1_RTS ⁽¹⁾ from MCU; GPIO_PA12; USB_DP for Firmware upgrade(RHF76-052AN)
12	SWDIO	I/O	SWDIO of SWIM for program download;
13	SWCLK	I/O	SWCLK of SWIM for program download;
14	PA15	I/O	Boot_EN (GPIO_PA15), Connect to a toggle switch to enable DFU mode for FW upgrade.

Number	Name	Type	Description and application
15	PB3	I/O	GPIO_PB3
16	PB4	I/O	Status LED (GPIO_PB4) trigger, connect to an external LED to show status of LoRaWAN processing
17	NC	-	Connected to Ground
18	NC	-	Connected to Ground
19	NC	-	Connected to Ground
20	PA3/ADC3	I/O	GPIO_PA3
21	PB5	I/O	Status LED (GPIO_PB5) trigger, connect to an external LED, Reserved
22	USART1_TX	I/O	USART1_TX of Modem, connect to RXD of Host MCU
23	USART1_RX	I/O	USART1_RX of Modem, connect to TXD of Host MCU
24	I2C_SCL	I/O	GPIO_PB8
25	I2C_SDA	I/O	GPIO_PB9
26	PC13/Wkup2	I/O	GPIO_PC13
27	NRST	I	Reset trigger input of Modem
28	PA0/AD0	I/O	GPIO_PA0
29	GND	-	Ground
30	RFIO_HF	-	RF input/output in high band, i.e. 868MHz/915MHz
31	GND	-	Ground
32	RFIO_LF	-	RF input/output in low band, i.e. 434MHz/470MHz
33	GND	-	Ground

Note: (1) Optional handshake lines are supported in future firmware releases.
 (2) GPIO couldn't be controlled by Host MCU by UART in current version.



The diagram illustrates the hardware setup for the Ra-03A module, which is a USB-to-UART bridge. The module is connected to a VCC3V3 power source and a Host MCU. The Host MCU is connected to the module's UART pins (TX, RX) and the DFU backup pins (KEY, LED, Status). The module also has two antennas: a 433/470MHz ANT and an 868/915MHz ANT. The module's pins are labeled as follows:

- VCC**: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
- GND**: 33, 32, 31, 30, 29, 28, 27, 26, 25, 24, 23, 22, 21
- RFIO**: LF, HF
- NSS**: 6, 7, 8, 9, 10, 11, 12, 13
- SCK**: 7, 8, 9, 10, 11, 12, 13
- MISO**: 8, 9, 10, 11, 12, 13
- MOSI**: 9, 10, 11, 12, 13
- USART**: CTS, RTS, SWCLK, TX, RX
- PA**: PA5, PB3, PB4, NC, NC, PA3
- PB**: PB3, PB4, NC, NC, PA3
- KEY**: 14, 15, 16, 17, 18, 19, 20
- LED**: 21
- Status**: 22

The Host MCU is connected to the module's UART pins (TX, RX) and the DFU backup pins (KEY, LED, Status). The module also has two antennas: a 433/470MHz ANT and an 868/915MHz ANT.

Figure 1 RHF76-052 Reference Design

Hardware design description:

- 1) VCC operation range: +1.8V to +3.6V
- 2) Pin22 and Pin 23 of the Modem would be used as UART port, please connect to Host MCU. Pin22 should be connected to RXD of Host MCU, and Pin23 should be connected to TXD of Host MCU.
- 3) For RHF76-052: Pin4 and Pin5 of the Modem would be used as FW upgrade port based on UART connection. Pin4 should be connected to RXD of Host, and Pin5 should be connected to TXD of Host.
- 4) Pin14 (GPIO_PA15) would be used to enable the DFU mode for FW upgrade. Please connect it to a toggle switch to achieve DFU enable function via a hardware way.

Note: Customer could also use a SW way with AT command to access into DFU mode.
- 5) Pin16 would be used to show LoRaWAN processing status. Please connect this pin to a LED if need.

This LED would blink when transmit or receive a message in LoRaWAN mode.
- 6) Pin21 would be used to be reserved for LED connection.
- 7) RHF76-052 UART modem support both low band (434MHz/470MHz) and high band (868MHz/915MHz). When use an internal antenna with mismatch impedance, a π topology for antenna matching is strongly suggested.



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