

Ra-08-Kit Specification

Version V1.2.1

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Document Revision History

Version	Date	Created / Revised Content	Prepared by	Approved by
V1.2.0	2022-03-02	First edition	Li Xiaocheng	Xu Hong
V1.2.1	2026-09-16	Modified certain content and the RGB LED descriptions; updated the warm/cool LED markings on the schematic	Liu Hong'en	Xu Hong

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1. Product Overview

The Ra-08-Kit is a LoRaWAN development board designed and developed by Shenzhen Ai-Thinker Technology Co., Ltd. The board is equipped with a LoRa module and exposes serial interfaces and peripheral header pins. With the factory firmware, LoRaWAN transmission and reception can be easily controlled by sending commands through a serial terminal.

The ASR6601 chip used on the development board is a general-purpose LPWAN wireless communication SoC integrating an RF transceiver, a modem, and a 32-bit RISC MCU. The MCU uses an ARM core and operates at a frequency of up to 48MHz. The Ra-08 module supports LoRa modulation and legacy (G)FSK modulation for LPWAN applications. The transmitter also supports BPSK and (G)MSK modulation, while the receiver supports (G)MSK modulation.

The Ra-08 module on the development board provides ultra-long-range, ultra-low-power communication for LPWAN applications. It can be widely used in smart meters, supply chain and logistics, home and building automation, security systems, remote irrigation systems, and other applications.

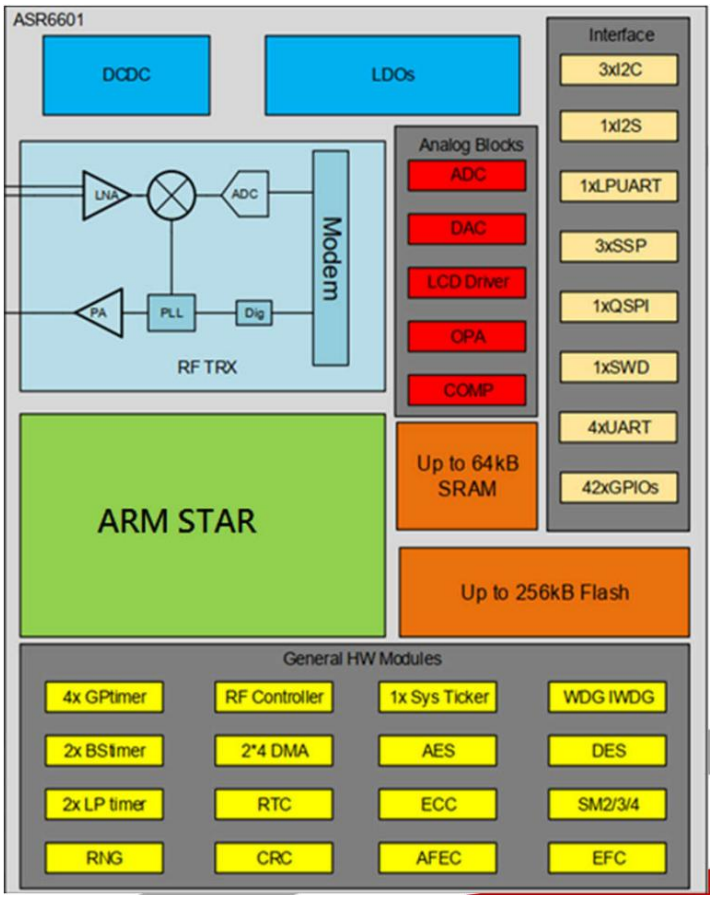


Figure 1 Main Chip Architecture Diagram

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1.1. Features

- Adopts DIP-30 package.
- Interface types: standard Micro-USB connector and pin headers with a 2.54mm pitch.
- Supported frequency band: 410–525MHz.
- Development board operating voltage: 3.3V or 5V; theoretical maximum transmit power: +22dBm.
- High sensitivity: -138dBm@125kHz SF12.
- Supported spreading factors: SF5, SF6, SF7, SF8, SF9, SF10, SF11, and SF12.
- Embedded memory: 128KB Flash and 16KB SRAM.
- Supports LoRa, (G)FSK, BPSK, and (G)MSK modulation.
- Supports multiple sleep modes, with deep-sleep current as low as 0.9μA.
- Supports an external antenna through an SMA connector.

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2. Key Specifications

Table 1 Key Specifications

Development Board Model	Ra-08-Kit
Compatible Module	Ra-08
Package	DIP-30
Dimensions	48.26×25.40 (±0.2)mm
Antenna Type	External antenna via SMA connector
Frequency Range	410–525MHz
Operating Temperature	-40–85℃
Storage Conditions	-40–125℃, <90% RH
Power Supply Range	Supply voltage: 3.3V or 5V; supply current >500mA
Supported Interfaces	UART/GPIO/ADC/DAC/I2C/I2S/SPI/PWM
Available I/Os	12
UART Baud Rate	Low-speed serial port, default 9600bps
Transmission Protocol	LoRaWAN, LinkWAN
SPI Flash	128KByte

2.1. Power Supply Selection

The Ra-08-Kit supports three power supply modes:

- Micro-USB interface (default)
- 3V3 and GND pin header
- 5V and GND pin header

It is recommended to use the first power supply mode: power via the Micro-USB interface.

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2.2. Electrostatic Requirements

Ra-08-Kit is an ESD-sensitive device and requires special precautions during handling.



Figure 2 ESD Protection Diagram

2.3. Electrical Characteristics

Table 2 Electrical Characteristics

Parameter	Name		Min	Typ	Max	Unit	Remarks
Operating Temperature	TOPR		-40	25	85	℃	Industrial-grade design
Supply Voltage (Micro-USB)	VCC		4.75	5	5.25	V	/
Supply Voltage (Pin Header)	VCC		2.7	3.3	3.6	V	≥ 3.3V ensures the output power
	VCC		4.5	5	5.3	V	≥ 5V ensures the output power
Power Consumption	Sleep Mode	Consumption 1	-	0.9	-	μA	0.9μA@without RF/MCU retention, without RTC
		Consumption 2	-	1.3	-	μA	1.3μA@with RF/MCU retention and RTC
	Standby Mode		-	3.83	-	mA	Power on
	Full-Load Mode (TX: 21dBm)		-	115	-	mA	DC-DC used, 21dBm
	Receive Mode (RX: SF10)		-	9.5	-	mA	DC-DC used

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2.4. Digital I/O Characteristics

Table 3 Digital I/O Characteristics

Description		Typ			Unit
Operating Frequency		410–525			MHz
Parameter	**Name**	**Min**	**Typ**	**Max**	**Unit**
I/O Level	VIO	2.7	3.3	3.6	V
Low-Level Input Voltage	VIL	-	-	0.2	V
High-Level Input Voltage	VIH	0.8	-	-	V
Low-Level Output Voltage	VOL	-	-	0.1	V
High-Level Output Voltage	VOH	0.9	-	-	V

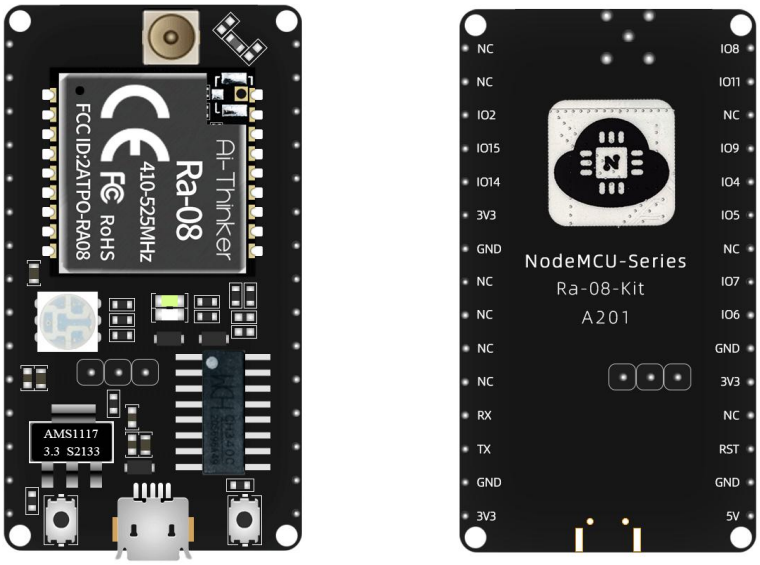
2.5. RF Specifications

Table 4 RF Specifications

Output Power					
Mode	**Frequency Band**	**Min**	**Typ**	**Max**	**Unit**
TX Power	433MHz	-	21	-	dBm
TX Power	470MHz	-	21	-	dBm
TX Power	490MHz	-	21	-	dBm
TX Power	510MHz	-	21	-	dBm
Receiver Sensitivity (Modulation Bandwidth: 125kHz)					
Mode		**Min**	**Typ**	**Max**	**Unit**
SF7		-	-123	-	dBm
SF8		-	-126	-	dBm
SF9		-	-128	-	dBm
SF10		-	-131	-	dBm
SF11		-	-135	-	dBm
SF12		-	-138	-	dBm

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3. Appearance and Dimensions



Top View Bottom View

Figure 3 Development Board Appearance
(Images and silkscreen markings are for reference only. The actual product shall prevail.)

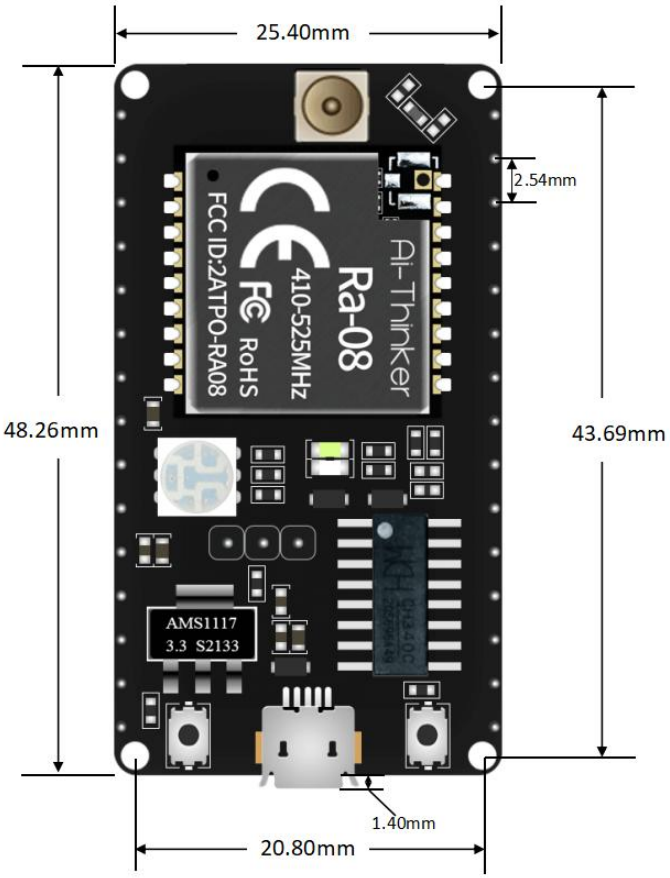


Figure 4 Development Board Dimensions

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4. LED and Button Description

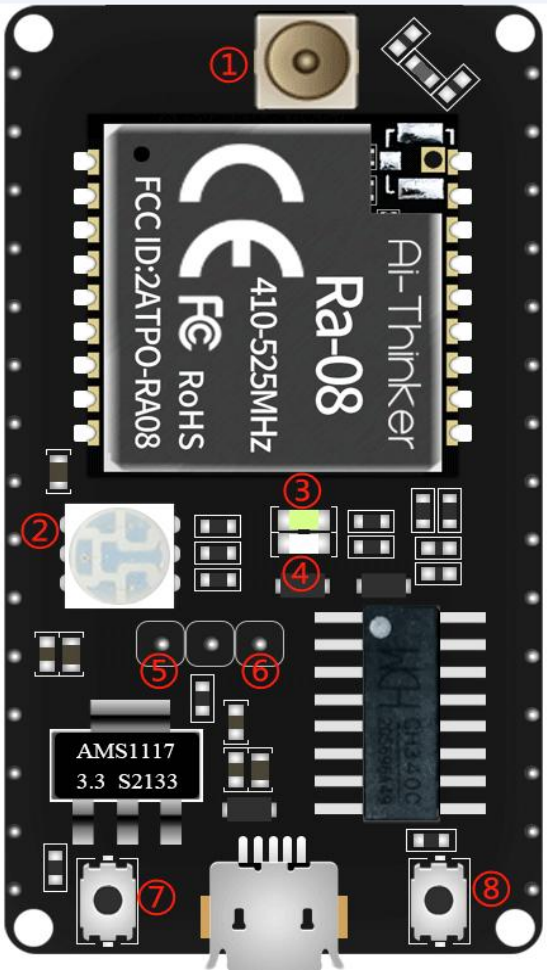


Figure 5 Ra-08-Kit's LED and Button Location

Table 5 Ra-08-Kit's LED and Button Function Description

No.	Function Description
①	SMA connector
②	RGB LED (the red LED is connected to IO7, the green LED is connected to IO4, and the blue LED is connected to IO5.)
③	Cool LED (IO14)
④	Warm LED (IO15)
⑤	Programming serial port
⑥	AT serial port
⑦	Reset button
⑧	Programming button

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5. Pin Definition

The Ra-08-Kit exposes a total of 30 pins, as shown in the pin diagram. The pin function definition table provides the detailed interface specifications.



Figure 6 Development Board Pin Diagram (Bottom View)

Table 6 Pin Function Definitions

No.	Name	Function
1	IO8	GPIO8/ADC_IN1
2	IO11	GPIO11/ADC_IN0
3	NC	NC
4	IO9	GPIO9/DAC_OUT
5	IO4	GPIO4/SSP1_CLK
6	IO5	GPIO5/SSP1_NSS
7	NC	NC
8	IO7	GPIO7/SWD_CLK
9	IO6	GPIO6/SWD_DATA

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10	GND	Ground; connect to the power supply reference ground
11	3V3	3.3V power supply; recommended supply current >500mA
12	NC	NC
13	RST	RSTN_IN external reset
14	GND	Ground; connect to the power supply reference ground
15	5V	5V power supply; recommended supply current >500mA
16	3V3	3.3V power supply; recommended supply current >500mA
17	GND	Ground; connect to the power supply reference ground
18	TX	GPIO17/UART_TX
19	RX	GPIO60/LPUART_RX or GPIO16/UART_RX
20	NC	NC
21	NC	NC
22	NC	NC
23	NC	NC
24	GND	Ground; connect to the power supply reference ground
25	3V3	3.3V power supply; recommended supply current >500mA
26	IO14	GPIO14/I2C_SCL
27	IO15	GPIO15/I2C_SDA
28	IO2	GPIO2/BOOT
29	NC	NC
30	NC	NC

Table 7 Module Boot Modes

Pin	Default State	SPI Boot Mode	Download Boot Mode
IO2	Pull-Down	0	1

Note: Some pins have been pulled up internally, please refer to the schematic.

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6. Schematic

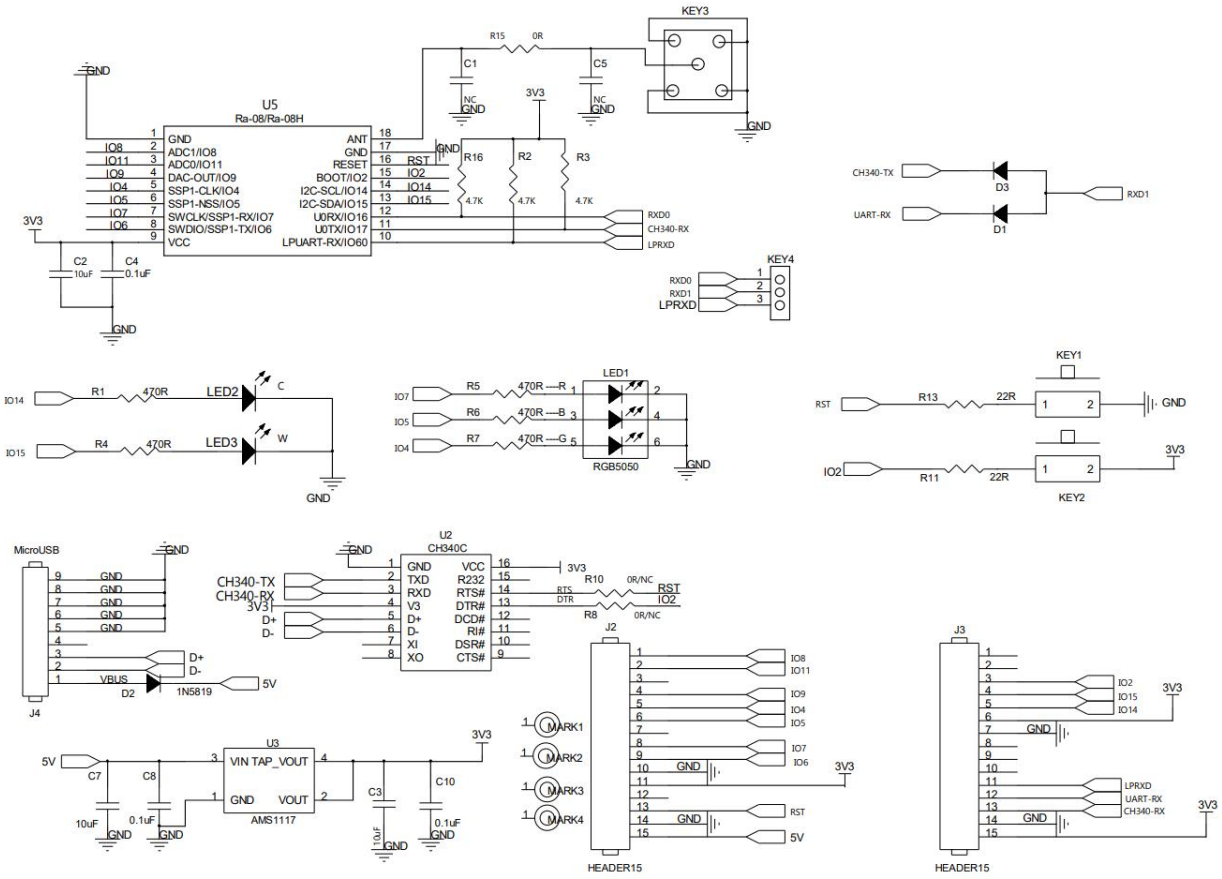


Figure 7 Development Board Schematic

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7. Related Product Models

Table 8 Related Product Models

Product Model	Frequency Band	Power Supply	Package	Dimensions	Antenna Interface
Ra-08	410–525 MHz	3.3V, I>500mA	SMD-18	16 × 16 (±0.2)mm	Castellated hole / through hole / IPEX connector
Ra-08H	803–930MHz	3.3V, I>500mA	SMD-18	16 × 16 (±0.2)mm	Castellated hole / through hole / IPEX connector
Ra-08-Kit	**410–525MHz**	**5V, I>500mA**	**DIP-30**	**48.26 × 25.40 (±0.2)mm**	**SMA-K**
Ra-08H-Kit	803–930MHz	5V, I>500mA	DIP-30	48.26 × 25.40 (±0.2)mm	SMA-K
Product related information: https://docs.ai-thinker.com/lr					

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8. Packaging Information

Table 9 Packaging Information

Packing List	Packaging Method	Quantity per Bag (ESD Bag)	Quantity per Bag (Sealed Bag)
Ra-08-Kit	Foam + ESD bag	1pcs	20pcs

9. Contact Us

Official Website Official Forum Development DOCS LinkedIn

Tmall Store Taobao Store Alibaba Store

Technical Support: support@aithinker.com

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