AK724

Dalang Communication Technology Co., Ltd Product Specification

Product Name:	GNSS Receiver
Product Model:	AK724
Version Number:	V 1.0
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1 Product Application Scenarios

The AK724 module is a high-precision RTK (Real Time Kinematic) receiver module that uses independently developed advanced GNSS baseband chips. It supports the reception of multiple satellite signals such as Beidou, GPS, GLONASS, Galileo, etc., providing centimeter level real-time positioning accuracy. This module integrates high-performance anti-interference algorithms and low-power design, suitable for high-precision positioning scenarios such as drones, precision agriculture, intelligent driving, and surveying and mapping. It has the characteristics of fast convergence, stability, and reliability. Its compact packaging and industrial grade reliability allow for flexible integration into various terminal devices, providing users with cost-effective RTK solutions and significantly improving positioning efficiency and accuracy in complex environments. Refer to Figure 1 for details.

Figure 1 Product Application Scenarios

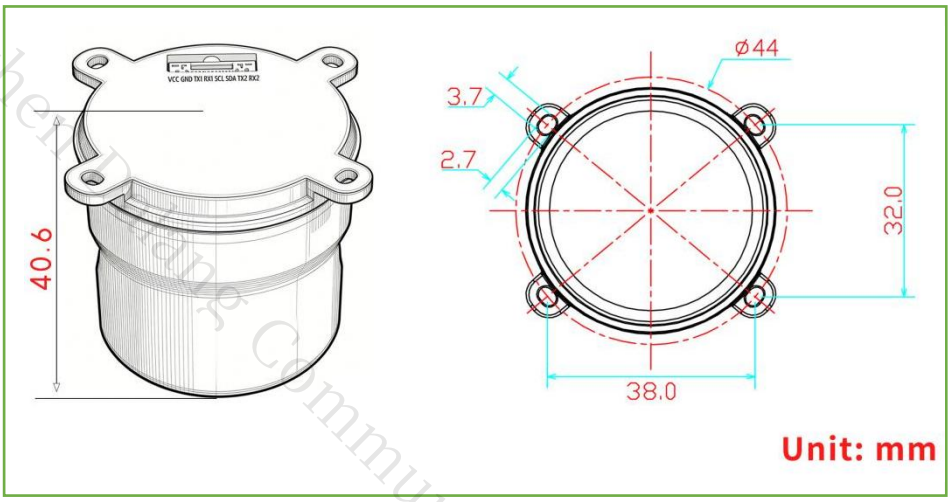
2 Features

In this chapter, we will delve into and comprehensively elaborate on the functionalities and operating principles of the AK724, detailing how it plays a pivotal role in various applications as follows:

1. **Multi system compatibility:** Supports mainstream global satellite navigation systems such as Beidou, GPS, GLONASS, Galileo, etc., enhancing signal coverage and positioning reliability.
2. **Centimeter level high precision:** Using RTK (Real Time Kinematic) technology, it provides real-time centimeter level positioning to meet the requirements of high-precision applications.
3. **Strong anti-interference ability:** Equipped with advanced anti multipath and anti electromagnetic interference algorithms, it can maintain stability in complex environments.
4. **Low power design:** Optimized power management, suitable for energy sensitive application scenarios such as drones and portable devices.
5. **Rapid convergence:** High sensitivity receiving technology reduces RTK initialization time and improves operational efficiency.
6. **Industrial grade reliability:** wide temperature working range, earthquake and dust resistance, suitable for harsh outdoor environments.
7. **Compatibility:** Fully compatible with other automatic flight control systems such as Pixhawk and APM, with good compatibility and seamless integration support for multiple flight platforms.
8. **Low noise reduction:** Industrial grade low-noise RF circuits are used, which have strong resistance to multipath suppression and improve signal reception quality.
9. **Equipped with inertial navigation:** Built in single IMU inertial navigation, deeply coupled with GNSS, low power consumption and low cost, short-term accurate blind correction without satellite, suitable for conventional navigation of medium and light equipment..

3 Structural Characteristic

In this section, we will conduct an in-depth analysis of the product's design details, presenting its aesthetic features and precise interface specifications through detailed structural diagrams. This perspective aims to provide a comprehensive framework, thereby enhancing the understanding and perception of the product's architecture. Refer to Figure 2, Figure 3,Table 1.



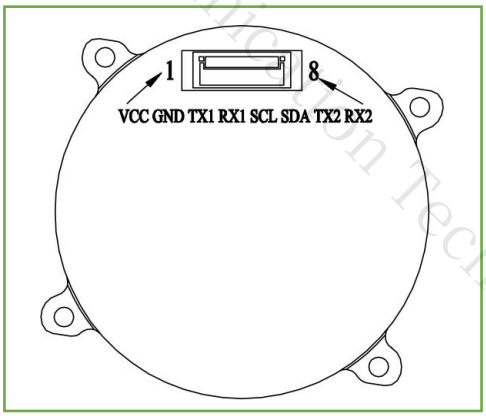


Figure 2 Dimensional Drawing (in millimeters)

Table 1 PIN Function

NO.	Pin name	Description
1	VCC	Main power input,+3.3V~5V
2	GND	Module grounding
3	TX1	UART1 output, 3.3V TTL
4	RX1	UART1 input, 3.3VTTL
5	SCL	I²C serial clock
6	SDA	I²C serial data
7	TX2	UART2 output, 3.3V TTL
8	RX2	UART2 input, 3.3VTTL

4 Specifications

In this section, we will provide a detailed list and explanation of the product's chip features, sensitivity, accuracy, operating principles, and other technical details, as detailed in Table 2.

Table 2 Product Specifications

Chip characteristics	Chip	Beiyun M21
	Operating Frequency	BDS-2: B1I/B2I/B3I BDS-3：B1C*/B2a/B2b(PPP)*/B3I GPS: L1 C/A/L1C*/L2/L5 GLONASS: G1/G2 Galileo: E1/E5a/E5b/E6(HAS)* QZSS: L1C/A/L1C/L2/L5、L6(CLAS)* NavIC: L5 SBAS*:L1C/A
	Receiving channel	1507 channel
Accuracy	Horizontal positioning accuracy (RMS)	Single point: 1.5m
		RTK:1.0cm + 1ppm
	Elevation positioning accuracy (RMS)	Single point: 2.5m
		RTK:1.5cm + 1ppm
	Timing accuracy (RMS)	≤ 20 ns
	Speed accuracy (RMS)	0.03m/s
	RTK calculation delay	50ms
Start Time	cold start	30s
	hot start	5s
	RTK initialization time	<5s (typical value)
	Lost lock recapture time	<1s
IMU performance (Gyroscope)	range	±300° /s
	angle random walk	0.5° / √h
	Zero bias instability	5° /h
	Full temperature zero bias	0.3° /s

	Scale error	4‰
	Three-axis orthogonal coupling error	1.7（0.1°）‰）
IMU performance (accelerometer)	range	± 16g
	rate random walk	0.3m/s/ √h
	Zero bias instability	50 μg
	Full temperature zero bias	5 μg
	Scale error	2‰
	Three-axis orthogonal coupling error	0.9（0.05°）‰
	System functional safety*	ASIL B
Output data	Baud rate	115200bps (default) [Optional: 4800-921600]
	output interface	TTL
	Output Protocol	NMEA0183、RTCM 3.3
	update frequency	GNSS positioning: 5-10 Hz INS positioning: 100 Hz IMU raw data: 100 Hz
Differential data	Differential data	RTCM 3.3/3.2/3.1/3.0
	Carrier phase output	Support, output RAWX statement
	FLASH	built-in
Electrical specifications	working voltage	3~5.5V DC
	power consumption	800mW
Physical parameters	size	Φ44*40.6mm
	weight	21g
	joint	GH1.25mm 8pin
Environment	operation temperature	-35℃-80℃
	storage temperature	-40℃-95℃

5 Product Photos

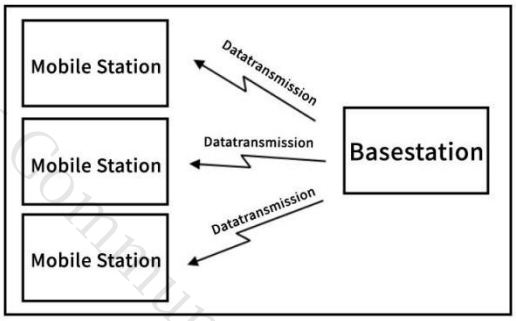
In this chapter, we will showcase real-life images of the product, as shown in Figure 4. These images provide a detailed view of our product from various angles and perspectives. We believe that through authentic representation, we can better convey the value and concept of the product, thereby enhancing your trust and satisfaction.

Figure 4 Product Images

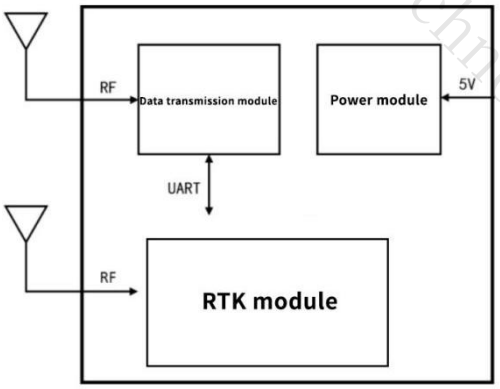
6 Typical Applications

6.1 Application of high-precision positioning for medium and short distances

In high-precision positioning applications for medium to short distances (<3km), the module can be combined with a data transmission module to form a complete high-precision positioning system with only a small amount of external circuits. It is suitable for applications with a large number of mobile stations in a small range, and the module is fully compatible with other automatic flight control systems such as Pixhawk and APM. The schematic diagram is as follows:



The reference station is stationary and fixed, and differential data is broadcasted to all mobile stations through a data transmission module. The circuit diagrams of the mobile station and the reference station are as follows:



3) If the antenna coordinates have been accurately determined through other surveying methods, please use the # set position command to input the antenna coordinates into the reference station module in latitude, longitude, and altitude format;

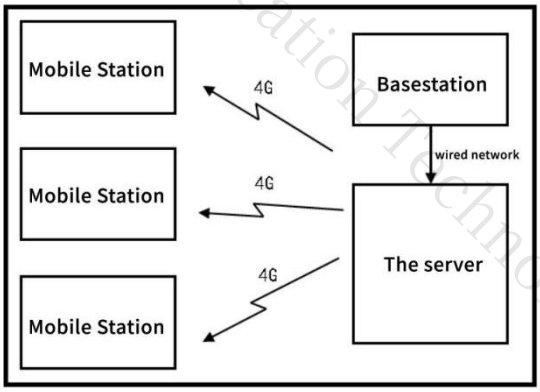
4) If the antenna coordinates are unknown, please wait patiently for about 5 minutes. The module will calculate the antenna position as accurately as possible. After the calculation is c

ompleted, the differential data port will begin to output data. At this point, the base station has already recorded the coordinates and broadcasted them wirelessly to ensure that the base station does not lose power, as the coordinates will be recalculated after a power outage and the repeatability of the mobile station measurement points cannot be guaranteed;

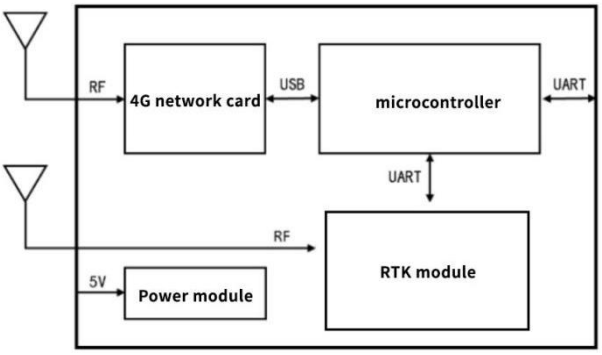
5) Install the mobile station antenna on the mobile carrier, confirm receipt of differential data, and wait for about 120 seconds to obtain high-precision positioning results.

6.2 Application of Medium to Long Range High Precision Positioning

In the application of high-precision positioning over medium to long distances (<10km), common data transmission modules are difficult to provide reliable differential data connections and suffer from serious packet loss problems. For this purpose, the company provides a solution based on 4G network (as shown in the figure below). The benchmark station sends differential data to the server through a wired network and is cached by the server. Mobile stations access servers through 4G networks to obtain differential data. This solution can greatly expand the coverage area of base stations, and mobile stations equipped with 4G network cards can simultaneously transmit positioning results back to designated servers.



The circuit diagram of the mobile station is as follows:



In practical applications, the number of mobile stations that a server can access simultaneously is limited only by server performance and is more suitable for a large number of users. Requirements between the server and the base station: the server can be directly accessed from the public network (with a public IP address), and a network connection can be established between the base station and the server (either through the public network or local area network).

6.3 High precision positioning application without reference station

In high-precision positioning applications without reference stations, the module needs to cooperate with the 4G communication module to obtain differential data. We provide Qianxun with differential data sources nationwide, and users can obtain high-precision positioning results without deploying base stations. The circuit diagram is as follows: