

RFS27-S-UART/CAN

Drone Obstacle Avoidance Radar White Paper

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Version History

Date	Version	Version Description
Sep 11, 2019	1.1	First version of RFS27-S-UART/CAN White Paper
June 11, 2021	1.2	Document format correction

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Abstract: The RFS27-S-UART/CAN obstacle avoidance radar is a lightweight millimeter-wave obstacle avoidance radar sensor. It can accurately provide obstacle distance information in various complex

environments. Adopting a highly integrated solution, it features small size, high precision, long detection distance and high stability. Compared with infrared, laser and other sensors, it has stronger ability to penetrate fog, smoke and dust, and higher angle measurement accuracy. It is suitable for drone obstacle avoidance applications such as agricultural plant protection and power inspection.

1. Overview of Drone Obstacle Avoidance Application Requirements

In recent years, with the rapid growth of the drone market, its related technologies are undergoing rapid changes. Among the many trends in drone technology, obstacle avoidance capability is a key link for drones to achieve automation and even intelligence. A complete obstacle avoidance system will greatly reduce the incidence of drone damage and accidents involving personal injury and buildings caused by operational errors. From the perspective of new products and technological development directions of various drone manufacturers, obstacle avoidance technology will tend to be improved in the next few years and become a standard system for mid-to-high-end drones.

2. Introduction to RFS27-S-UART/CAN Radar

The RFS27-S-UART/CAN is a lightweight millimeter-wave radar sensor. By actively transmitting fan-shaped 77GHz electromagnetic waves forward and processing the echo signals, the product judges whether there are obstacles ahead, feeds back information such as the relative distance, speed and azimuth angle between the obstacles and the radar, guides the radar carrier such as drones to avoid obstacles, and ensures its safe operation. Figure 1 shows the front view of the radar.

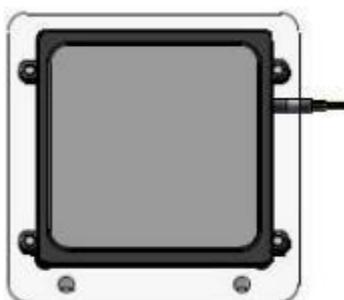


Figure 1 Front view of RFS27-S-UART/CAN obstacle avoidance radar

3. Product Features

The The RFS27-S-UART/CAN radar adopts a highly integrated MMIC solution, with extremely low power consumption (<2W), small size (50x50x1.6mm), measurement distance exceeding 20m, and lightweight design, which can meet the distance measurement and anti-collision application requirements in fields such as drones. The product uses 2 transmit antennas and 4 receive antennas, operating in the 77-81GHz frequency band with a bandwidth of 800M-4G. It can track 32 targets simultaneously and accurately measure the distance and angle information of the targets.

The RFS27-S-UART/CAN radar uses a UART interface. Combined with the general millimeter-wave radar management tool, customers can quickly and intuitively view the product detection result data. The default baud rate of the UART interface for board-level communication is 115200bit/s, and the target refresh rate is 20Hz. The universal external interface can be quickly integrated with the upper computer or other MCUs, saving users' configuration and use time.

4. Product Specifications

Table 1 RFS27-S-UART/CAN Main Parameter List

Characteristics	Parameters	Technical Indicators
Antenna Performance	Horizontal Beamwidth	±17°
	Vertical Beamwidth	±3°
	Maximum EIRP (dBm)	30
Radar Performance	Range Measurement Range (m)	1.5~20
	Range Measurement Accuracy (m)	Better than 0.1
	Range Resolution (m)	0.18
	Transmission Frequency (GHz)	77~81
Radar Attributes	Refresh Rate (Hz)	20
	Chirp Bandwidth (GHz)	0.8

Characteristics	Parameters	Technical Indicators
System Attributes	Operating Voltage (V)	8~24
	Operating Temperature	-40°C ~65°C
	Power Consumption (W)	2
	Waterproof Grade	IP67
	Data Interface	UART
	PCB Dimensions (L, W, H) (mm)	50 50 7.8

5. Application Fields

In recent years, with the booming drone market, a large number of drones have encountered flight obstacles in the air, leading to frequent flight difficulties. Therefore, anti-collision is also one of the key challenges restricting the development of drones. Millimeter-wave radar has a detection distance more than ten times that of ultrasonic waves, high frequency and strong anti-interference ability, and has become a standard accessory for drones. The characteristics of millimeter-wave radar such as small size, high resolution and low power consumption fully meet the strict requirements of drones for size and power consumption. The RFS27-S-UART/CAN is a millimeter-wave radar product for drone obstacle avoidance launched based on market feedback. This product is an ideal choice for low-altitude operation drones such as plant protection drones.

The RFS27-S-UART/CAN has a flexible installation position and is suitable for various types of drone platforms. It is directly interconnected with the drone flight control system through the UART serial port. At the same time, one or more modules can be installed synchronously according to application requirements to expand the flight detection angle. It transmits low-power electromagnetic beams to the surroundings, captures echo signals to calculate the distance, speed and angle of obstacles, thereby guiding the drone flight control system to quickly make decisions to adjust the flight direction.

Advantages of RFS27-S-UART/CAN in drone anti-collision:

- Low cost and low power consumption;
- Strong detection capability for weak targets;
- Accurate and stable obstacle detection;
- Long measurement distance and strong anti-interference ability.



Figure 2 Application case of RFS27-S-UART/CAN millimeter-wave radar in drone obstacle avoidance

6. Conclusion

The RFS27-S-UART/CAN product is a cost-effective medium-distance anti-collision millimeter-wave radar sensor in China. It has precise angle measurement, speed measurement and distance measurement performance, which can meet the rapidly growing distance measurement and anti-collision application requirements in drones and related fields. Different from the short-range infrared sensors we are familiar with, this sensor uses low-power electromagnetic waves that are completely harmless to the human body for target detection. At the same time, we provide high-quality after-sales service and detailed user manuals to solve the difficulties in your use.