

Acer Gadget Inc.

ARFSA06
24GHz Radar
User Guide



Version: 1.0

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1. Overview

This document serves as an overview of the product specifications for the 24GHz mmWave Radar Sensor manufactured by Alpha Networks Inc.

The sensor's primary role centers on the detection of both distance and velocity pertaining to in-motion entities in close proximity. Its pivotal function lies in furnishing critical cautionary data, instrumental in minimizing collision hazards during vehicular operation.

While the utilization of this device can augment one's situational awareness, it remains imperative to underscore the enduring significance of cyclist attentiveness and prudent decision-making. Maintaining an unwavering cognizance of one's surroundings and steadfastly prioritizing the secure operation of the bicycle are fundamental tenets that cannot be supplanted. These principles remain pivotal for ensuring individual safety.

1.1. Purpose

This document provides a detailed description of the product specifications for the 24GHz mmWave Radar Sensor. It covers the crucial requirements pertaining to functionality, performance, design constraints, and external interfaces to the best of its current knowledge. While aiming to be as comprehensive as possible, it recognizes the potential for additional important requirements to be added at a later stage.

1.2. Scope

From a technical standpoint, this document holds priority over other documents. Its purpose is to streamline planning, design, testing, and manufacturing processes associated with the product. Serving as the comprehensive requirements document for the 24 GHz mmWave Radar Sensor, this Product Requirements Document equips the project team with vital information for understanding, designing, implementing, and managing the product. Additionally, the specifications sheet establishes a foundation for organizing business-related sales and support functions.

1.3. Audience

This document serves various audiences and fulfills specific purposes during the Planning Phase:

- Engineers: They can refer to this document while creating a high-level design, including the user interface, based on the requirements.
- Functional Area Managers and Program Manager: They can utilize this document to estimate resources and schedules, as well as identify potential program risks.
- Safety Manager, Quality Assurance, and Test Engineers: This document provides them with the necessary information to establish quality and safety criteria and plan for testing.
- Writers: They can rely on this document to plan the product documentation effectively.
- Product Planning: This document assists in planning the product's launch and distribution strategies.
- Product Support Engineers: They can refer to this document to devise a comprehensive plan for supporting the product throughout its lifecycle.

During the Development Phase, the approved version of this document functions as a crucial reference for the potential customers, project team, and internal suppliers. It ensures that the product being developed aligns with the defined product requirements. In case of any updates, the entire project team will be promptly notified and informed to ensure everyone is working with the most current information.

2. Description

The ARFSA06 product is an advanced integrated FMCW radar sensor designed for operation in the 24 GHz band. This radar sensor is specifically engineered to detect objects and measure their position in relation to the vehicle's motion. Its primary focus is to enhance safety by effectively addressing a critical concern on the road—the bike's blind spot, which is commonly associated with significant accidents and poses a constant threat to cyclists.

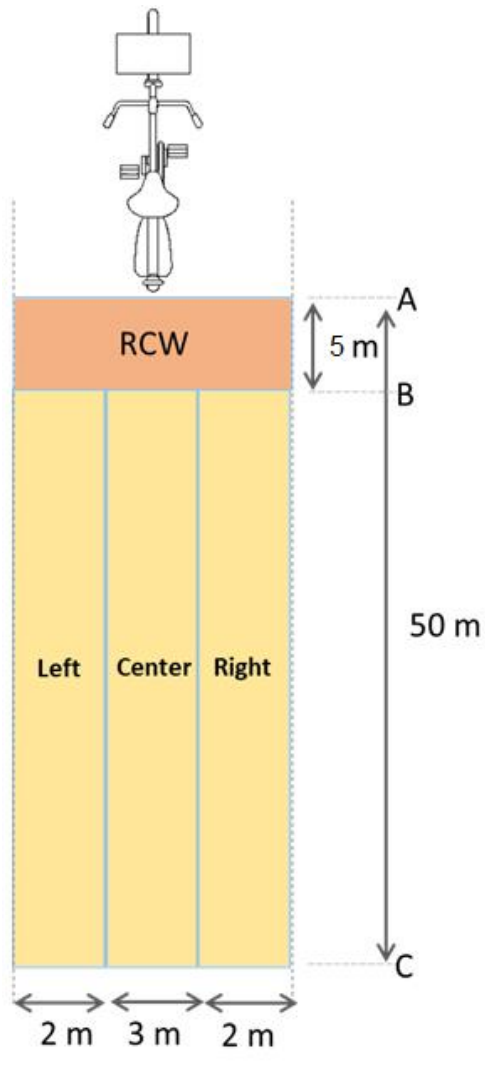
Tailored to the bike segment, this device stands as an economical solution. At the core of its design lies a singular mid-range radar sensor, contributing to a streamlined and effective package. This component triggers a warning signal whenever a swiftly approaching vehicle or one entering the bike's blind spot is detected. The implementation of this alert mechanism has the potential to significantly enhance road safety for users.

3. Key Features

- The ARFSA06 is a 24 GHz Radar specifically designed for Rear Collision Warning (RCW) applications.
- The radar enables simultaneous Doppler and Frequency-Modulated Continuous Wave (FMCW) processing, enabling fast scanning without the need for mode changes.
- It boasts low power consumption and high reliability, contributing to optimal performance.
- The compact size of the ARFSA06 facilitates easy integration into the bike's existing setup.
- It is capable of detecting rearward vehicles up to a range of 50 meters for RCW purposes.
- The ARFSA06 offers CAN Interface, allowing integration with various systems.
- The radar device complies with IP67 standards when housed properly.

4. Application

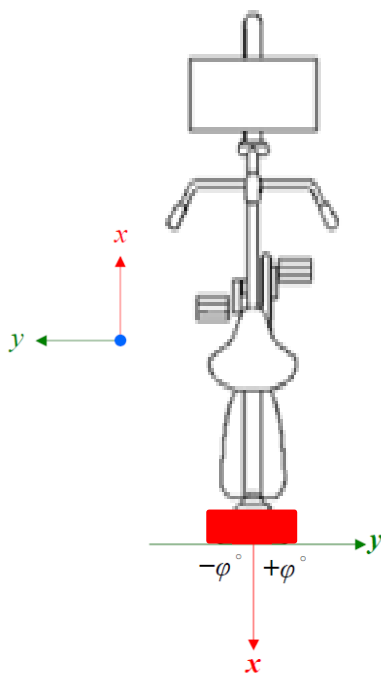
- **RCW radar system start conditions:**
Power ON
- **24GHz RCW radar detection behavior:**



1. **Right BSD Start condition:**
When the target enters between the B and C segments in the right area.
2. **Center BSD Start condition:**
When the target enters between the B and C segments in the center area.
3. **Left BSD Start condition:**
When the target enters between the B and C segments in the left area.
4. **The RCW Start condition:**
When the target enters between the A and B segments of the radar rear area.

5. Radar Setup

To fully utilize the capabilities of the ARFSA06 radar, it is crucial to set up the system correctly. For the Rear Collision Warning (RCW) application, it is advisable to install the radar at the back of the bike. It can be positioned underneath the rack, above the fender, or under the seat, provided that there are no metal materials or obstructions that may obstruct its detection area. Additionally, it's important to ensure that the long side of the radar is parallel to the ground with no angle of inclination. Finally, the recommended height for installation ranges from 60 to 90cm above the surface level, depending on the specific model of the bike.



- Mounting Angle:**
- 0 deg. (y axis)
 - 90 deg. (x axis)



6. Specifications

Parameter	Value	Unit
Radar Characteristics		
Operating frequency	24	GHz
Power Supply	12 (only Battery used)	V DC
Current Consumption (A)@12V	38	mA
Peak Current (A)@12V	180	mA
Distance measurement	50	m
Speed measurement	70	kph
FOV	H: ± 60 , V: ± 30	deg
Distance measurement accuracy	0.75	m
Emitted radar power	-8.0	dBm
Normal Power consumption@12V	0.34	W
Mechanical dimension	72(L) x 32(W) x 19(H)	mm
Mounting area	Rear, between 60~90cm above road surface level	
Temperature range	Operating : -40~ +85	°C
	Storage: -40~ +90	°C
Protection rating (Mating connector)	IP67	

** Specifications are subject to change without notice.

7. Warning Statement

7.1. FCC Warning Statement

FCC 15b devices (15.105)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Part 15.21 information for user

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

FCC Part 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

7.2. NCC Warning Statement / NCC 警語

LP0002 低功率射頻器材技術規範_章節 3.8.2

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

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前述合法通信，指依電信管理法規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。