White paper on CAR28F millimeter wave radar

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Version history

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2018-11-12	1.0	the 1st version of white paper on CAR28F

Contents

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Abstract: CAR28F is a 24Ghz vehicle mounted (Short Range Radar) millimeter wave radar with excellent performance in the industry. It's measuring the distance, speed, angle, etc. Information by detecting the difference between the transmitted radio wave and the echo. CAR28F compacts 96*57*24mm, with measuring distance of 30 meters and integrated peripheral interface (CAN interface) . It is of anti-collision function installed on low velocity vehicles, which satisfy the increasing needs of safety-assisted driving in the automotive industry.

Key words: CAR28F，one transmitter & mulch-receiver，SRR millimeter wave radar, cost-effective

1 Application requirements for automotive short-range radar

1.1 The development of Advanced Driving Assistance System

Nowadays, cars have become much more popular and have played vital roles in traveling. A variety of sensors installed on the cars help the ADAS system with surrounding sensing, data collection, static and dynamic object identification, detection and tracking, system operation and analysis combined with map navigation data, which assist drivers to avoid the potential dangers and effectively increase the comfort and safety of driving.

In recent years, the growth of the ADAS market, gradually from the high-end market into the low-end market is rapid. The improved millimeter-wave radar technology for system deployment will create new opportunities and strategies.

1.2 Application requirements for short - range radar

The traditional driving assistance system is mainly composed of laser radar, visual system, GPS and other modules, which do not accurately detect the surrounding obstacles under bad weather conditions, it often leads to serious traffic accidents, and the working environment of the visual system is demanding. Due to the constraints of the technology, processing technology, material costs and physical size, radar is mainly used in high-end vehicles and forward radar field.

The short-range millimeter-wave radar has the functions of BSD, LCA, etc. It has the characteristics of working day and night in all weather conditions, and can accurately detect the short-range target on the front and rear sides of the vehicle and play an important role in the ADAS system.

2 Overview on short-range radar CAR28F

2.1 Features

CAR28F is a very cost-effective short-range K-band millimeter-wave radar sensor system, monitoring distance of 30 meters, with high complexity FMCW modulation mode, can detect the moving target distance, speed, angle, with relatively long range and good accuracy .

- Movement
- Velocity
- Distance
- Direction
- Angle

CAR28F with the function of functions of anti-collision installed on low velocity vehicles.The product function diagram is as below:

Fig1.CAR28F Functions Diagram

CAN network interface of CAR28F sensor follows the ISO11898-2 specification, the communication rate of 500Kb/s. Universal external communication interface makes it easy to integrate with PC or other ADAS modules.

2.2 Parameters

CAR28F adopts 1T 2R antenna, which has good performance for azimuth angle identification. A narrow beam is used on the azimuth plane radiation pattern of the transceiver antenna to improve the target noise ratio, and the receiving channel adopts a long baseline to improve the angle measurement accuracy. At the same time, the low sidelobe technology is used to design the elevation plane pattern of the the transceiver antennas, which can effectively suppress ground clutter interference. The angle coverage of CAR28F is as follows:

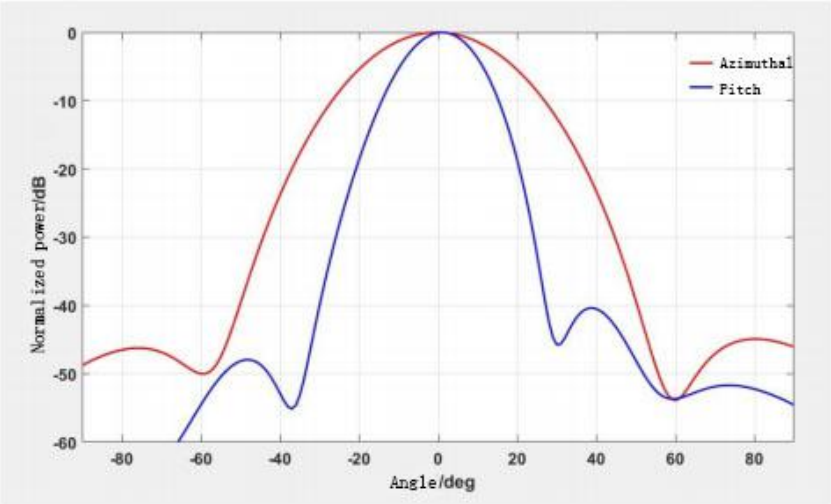

Fig2.Direction of CAR28F radar system

the parameters of CAR28F as follow:

Table 1.Parameters of Radar

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
System performance					
Transmit frequency		24.00		24.20	GHz
Output power（EIRP）			20		dBm
Update rate			20		Hz
Power consumption	@12V DC 25℃	1.5	1.65	1.8	W
Range/ Velocity -measurement characteristics					
Distance-measuring range	vehicles	0.1		30	m
Distance-measuring range	pedestrians	0.1		20	m
Distance-measuring accuracy			0.1		m
Velocity-measuring range		-60		60	km/H
Velocity-measuring resolution			0.24		m/s
Multi-target tracking					
Numbers of simultaneously tracked targets			8		Pcs
Antenna performance					
Beam width/TX	Azimuth (-6dB)		56		deg
	Elevation(-6dB)		40		deg
Other characteristics					
Supply voltage		6	12	32	V DC
Protection class		IP66			
Storage temperature		-40		125	℃
Operating temperature		-40		85	℃

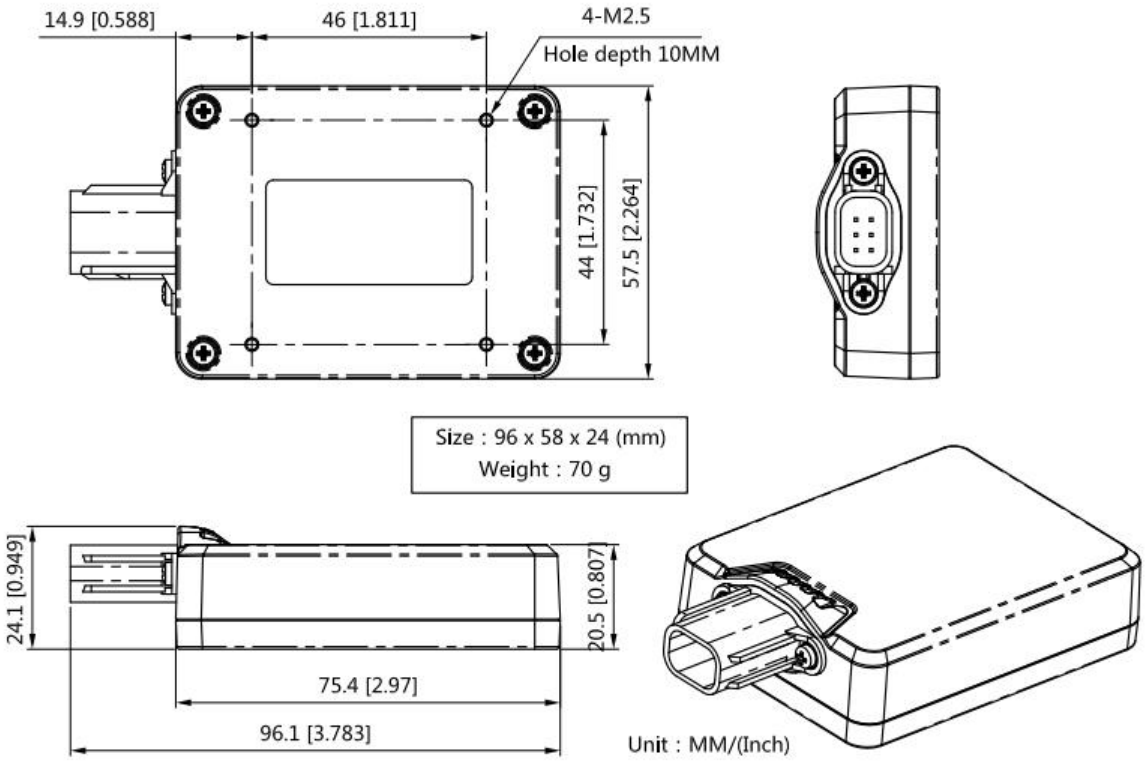

Fig3.Outline of the product

2.3 Applications

- FCW
- Multi sensory fusion
- RCW
- Research&Study

3 Application Cases

3.1 Learner-driven vehicle collision warning system and special vehicle backward collision warning System

Both Learner-driven vehicle collision warning system and special vehicle backward collision warning System adopt CAR28F millimeter wave radar sensor to monitor the environment behind or in front of the car, output and send the target's distance, speed and angle information to the main control box, which will analyze radar detection data and vehicle current situation to control warning or trigger automatic braking.

The Advantages of CAR28F:

1) Compact package, solid state technology;
2) Cost-effective, long detection distance;
3) High detection accuracy;
4) Leading performance and durability.

4 Conclusion

CAR28F is a short range automobile millimeter-wave radar developed by Nanoradar. The product adopts advanced MMIC technology and signal processing technology. Featured with long range detection, accurate velocity measurement and the stable performance, CAR28F can be widely used on low velocity vehicle for forward and backward collision warning, which can significantly improve the vehicle safety and relieve driver's pressure.

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