

# White paper on CAR28T millimeter wave radar



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## Version history

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# White paper on CAR28T millimeter wave radar

**Abstract:** CAR28T is a 24GHz vehicle mounted (Short Range Radar) millimeter wave radar with excellent performance in the industry, Measuring the distance, speed, angle, etc. information by detecting the difference between the transmitted radio waves and the echo. CAR28T compacts 96 × 57 × 24mm, with measuring distance of 35 meters. It integrates peripheral interface(CAN interface) with spot detection (BSD), lane change assistant (LCA),and other functions together to meet the increasing needs of the automotive industry safety-assisted driving.

**Key words:** CAR28T, Multiple charges, SRR millimeter wave radar, cost-effective

## 1 Application requirements for 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 CAR28T

### 2.1 Features

CAR28T is a very cost-effective short-range K-band millimeter-wave radar sensor system, monitoring distance of 50 meters, with high complexity FMCW modulation mode, can detect the moving target distance, speed, angle, with a high range.

CAR28T has the function of blind spot detection(BSD), lane change assistant (LCA), The product function diagram is as follows:

■	Movement
■	Velocity
■	Distance
■	Direction
■	Angle

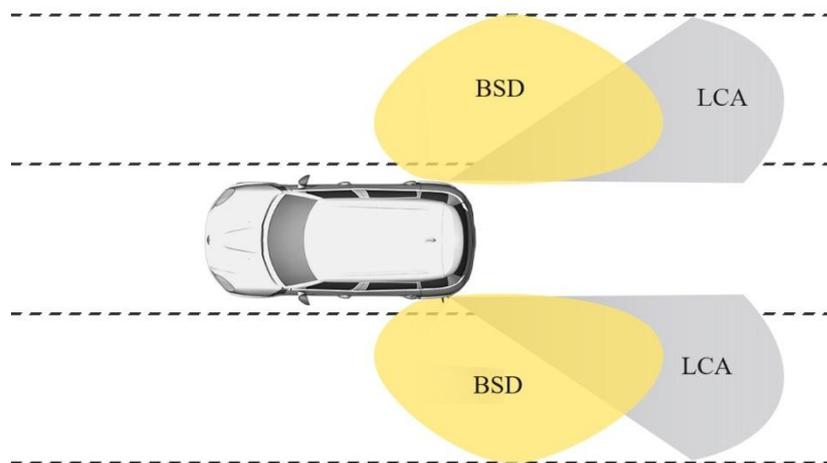


Fig1.CAR28T Functions Diagram

CAN network interface of CAR28T 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

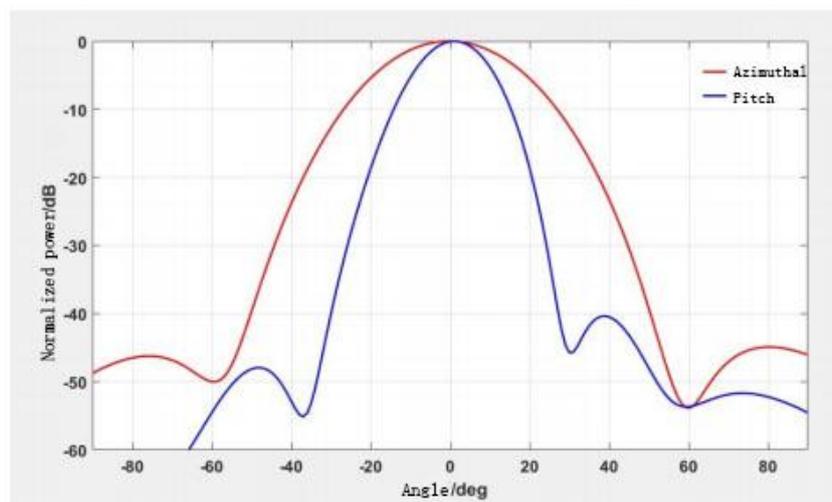


Fig2.Direction of CAR28T radar system

With a multi-antenna, the azimuth angle resolution of CAR28T is accurate. Both the transmitting antenna and the receiving antenna adopt the low sidelobe technique in order to improve the signal to noise ratio. The azimuthal side lobe suppression ratio is greater than 22dB, and the pitch side lobe suppression ratio is greater than 16dB.

the parameters of CAR28T as follow:

Table 1.Parameters of Radar

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>System performance</b>					
Transmit frequency		24.00		24.20	GHz
Output power (EIRP)			20		dBm
Update rate			20		Hz
Power consumption	@12V DC 25°C	1.5	1.65	1.8	W
<b>Range/ Velocity -measurement characteristics</b>					
Distance-measuring range	vehicles	0.1		35	m
Distance-measuring range	pedestrians	0.1		20	m
Distance-measuring accuracy			0.1		m
Velocity-measuring range		-70		70	m/s
Velocity-measuring resolution			2.4		m/s
<b>Multi-target tracking</b>					
Numbers of simultaneously tracked targets			8		Pcs
<b>Antenna performance</b>					
Beam width/TX	Azimuth (-6dB)		56		deg
	Elevation(-6dB)		37		deg
<b>Other characteristics</b>					
Supply voltage		6	12	32	V DC
Protection class		IP66			
Storage temperature		-60		125	°C
Operating temperature		-40		85	°C

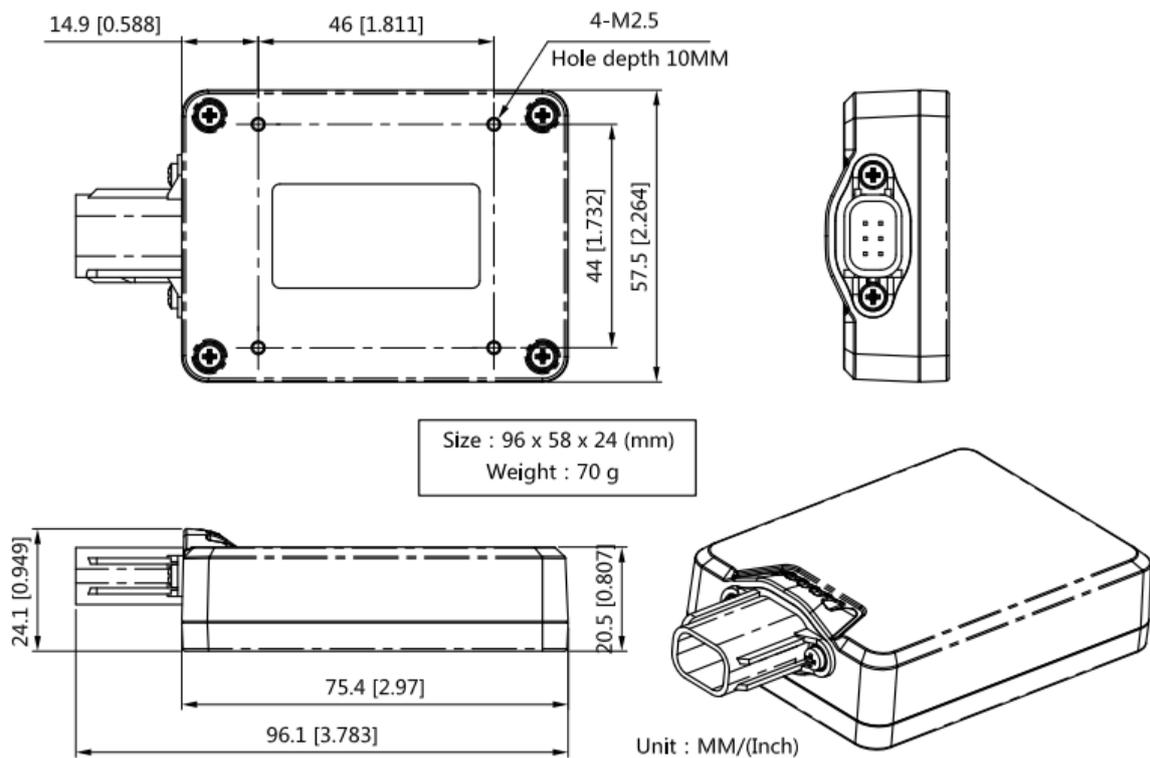


Fig3.Outline of the product

## 2.3 Applications

- BSD(Blind Spot Detection)
- Lane Change Assistant
- Multisensory fusion
- Display

## 3 Application Cases

### 3.1 Lane Change Decision Assistant System

Lane change decision assistant system consists BSD (Blind spot detection) and LCA (Lane change assistant). The CAR28T millimeter-wave radar is used to monitor the rear and both sides of the vehicle. It is usually composed of a pair of radars. The slave radar only detects the target's distance, speed, and angle information then sends to the master radar. The master radar not only have the detection function, but also need to receive the speed, steering angular velocity and other information of the car's own body, and test information to the car integrated decision-making system to do action decisions, or directly control of the brake.

The LCDAS monitoring area includes the "field of view" of the driving area and the area within 30 meters behind the vehicle and provides an auxiliary warning function when the driver is traveling or changing lanes. When the system recognizes that the vehicle lane may cause a risk of collision, the warning light in the corresponding exterior mirrors will light up or flash quickly to alert or warn the driver of potential risks. As an application of the Advanced Driving Assistance

System (ADAS) product, the system significantly reduces the risk of accidents in the poor weather conditions such as night, fog, and heavy rains.

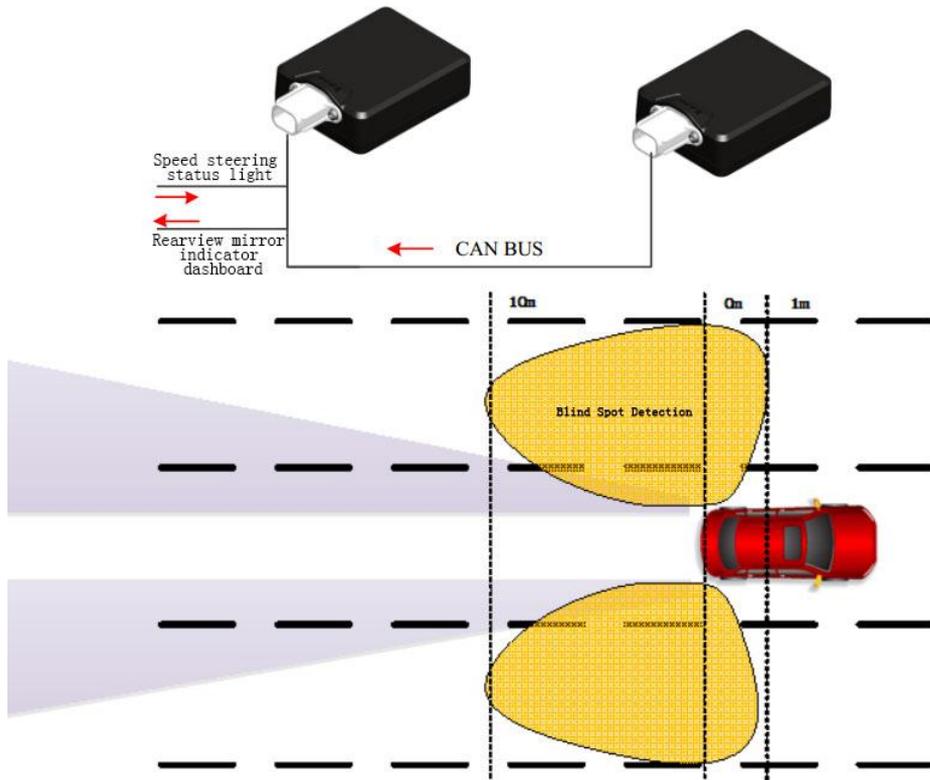


Fig4. System detection range map

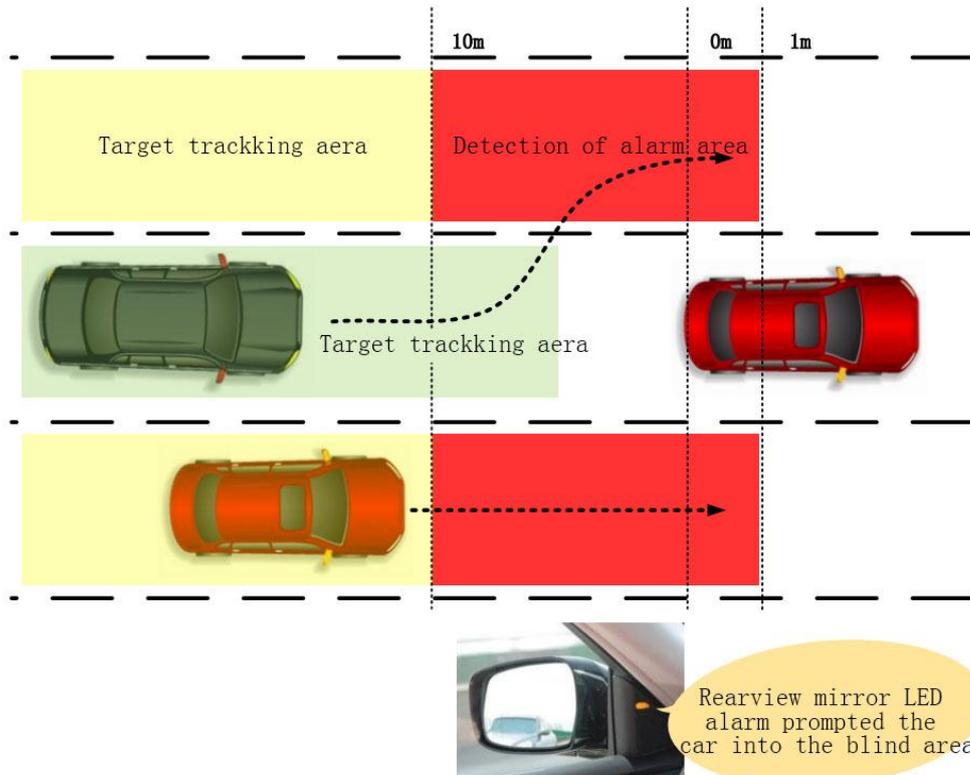


Fig5. Lane Change decision assistant system

Lane change decision assistance system work flow:

System starts LCA for long-range detection once the vehicle forward speed is greater than 20km/h;

When LCA detects the distance behind the target vehicle is less than 10 meters, system starts BSD function. Microwave sensor detection angle becomes larger to detect the target vehicle side within 3 meters and behind within 10 meters;

When the LCA detects that the target vehicle distance is greater than 10 meters, the system continues to start LCA function, microwave sensor detection angle becomes smaller, detect the car within 50 meters of the target;

When the current speed is less than 20km/h or the driver manually turns off the LCDAS function, the whole system will not work;

CAR28T can detect 8 moving targets at the same time. It has sufficient detection capabilities of pedestrians and vehicle within the detection range, greatly reduce the driver's driving burden.

CAR28T Advantages in LCDAS Applications:

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

## 4 Conclusion

CAR28T is a short range automobile millimeter-wave radar developed by Nanoradar. The product adopts advanced MMIC technology and signal processing technology. the detection range is wide, the speed is accurate, the performance is stable. It can be widely used in automobile blind spot detection, lane change assistant, rear cross traffic alert, forward cross traffic alert, radar / vision fusion, unmanned areas. Products can significantly improve safety performance of vehicles, reduce the driver's driving burden.

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