

77GHz Side Radar Specification  
For E-Bus ADAS system

Alpha Networks Inc. Confidential

## Index

<b>1</b>	<b>Product Description</b>	3
<b>2</b>	<b>Features</b>	3
<b>3</b>	<b>Specification</b>	4
<b>4</b>	<b>Product Dimension</b>	5
<b>5</b>	<b>Connector Definition</b>	5
<b>6</b>	<b>Radar Detection Zone</b>	6
<b>7</b>	<b>Radar Setup</b>	6
<b>8</b>	<b>Check &amp; Review List</b>	7
<b>9</b>	<b>Regulations</b>	8
9.1	EU Declaration of Conformity	8
9.2	FCC Warning Statement	8
9.3	NCC Warning Statement / NCC 警語	9
<b>10</b>	<b>Company Information</b>	9

## 1 Product Description

The project ARS-DA03 consists of an integrated two 77GHz FMCW- radar sensor box. This radar sensor is UNR151 compliant to avoid collisions/accidents between right-turning large vehicles and cyclists, usually at lower driving speeds or at a standstill, often to vulnerable road users (VRUs) cause serious consequences. The radar information is sent to the external control unit through the CAN interface for analysis and express warning alarm in detect area.

This system can satisfy the BSIS warning signal within the range of 30m behind or 7m in front of the front corner of the vehicle as well as ADAS features including BSD and LCA as a cost-effective 3-in-1 commercial vehicle solution.

## 2 Features

- ARS-DA03 adapted two TI AWR1642 2T4R 77GHz SoC radar solution as the lower cost solution
- R151 Compliant and support rear 30m and front 7m distance for bicycle detect, 4.25m lane width.
- Multiple modes: low speed (R151 mode - Less than 30 km/h), high speed (BSD/LCA mode - Over than 30 km/h)
- Detects moving vehicles, Moto, Bicycle
- 150ms radar cycle time
- Cost effective and robust design for all vehicle segments
- Around 4 cm thickness compact design, small size for easy integration into the vehicle
- 180-degree HFOV detect area coverage
- Immune to bad weather
- Programmable alert zones for customization if needed
- Support MIMO (CDD Mode)

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### 3 Specification

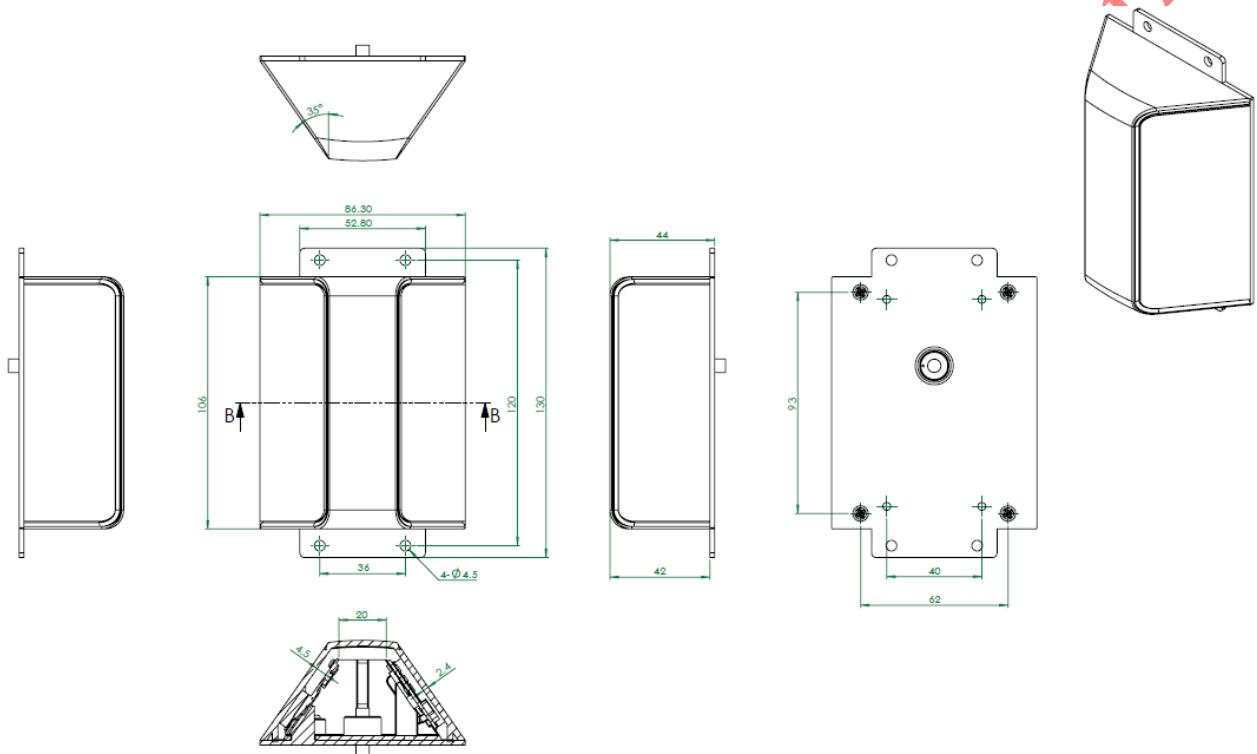
BSIS Radar Specification

Parameter	Front Radar(ARS-SA07)	Rear Radar(ARS-SA01B)	Unit
<b>Radar Characteristics</b>			
Frequency Band	76 ~ 77	76 ~ 77	GHz
Power supply	9-16	9-16	V DC
Detection range	<7m	<30m	m
Speed measurement range	BSIS Mode < 30km/h BSD/LCA Mode: > 30km/h	BSIS Mode: < 30km/h BSD/LCA Mode: > 30km/h	km/h
Field of view	H:100(±50) V:20(±10)	H:40 (±20) V:12(±6)	deg
Distance measurement accuracy	±0.25	±0.7	m
Speed measurement accuracy	1	1	km/h
Angle measurement accuracy	1.5	1.5	deg
Emitted radar power (EIRP Peak)	FCC/NCC: 19.00 CE: 23.87	FCC/NCC: 25.00 CE: 29.84	dBm
Emitted radar power (EIRP Average)	FCC/NCC: 6.44 CE: -0.56	FCC/NCC: 8.69 CE: 4.69	dBm
Update time	150	150	ms
Normal power consumption	6	6	W
<b>Miscellaneous</b>			
Vehicle interface	CAN		
Mechanical size (w/ connector)	106(L) x 86.3(W) x 44(H)		mm
Weight	261		g
Mounting area	vertically: between 80~100cm above road surface level (35 degree)		
Connector	10-pin female (socket) flat connector		
Vehicle integration	right or left front corner of vehicle		
Temperature range	operating : -40~ +85		°C
	storage: -40~ +90		°C
Reliability	ISO 16750		
Protection rating	IP69K		
Regulation / Certification compliant	CE, FCC, NCC		
<b>Modulation-related technical parameters</b>			
Frequency Range	76.50-76.74		
Modulation Bandwidth	240 (total bandwidth)		MHz
Modulation Type	FMCW		
Sweep Bandwidth	240 (total bandwidth)		MHz
Sweep Rate	100		Hz/s
Sweep Time	27		us

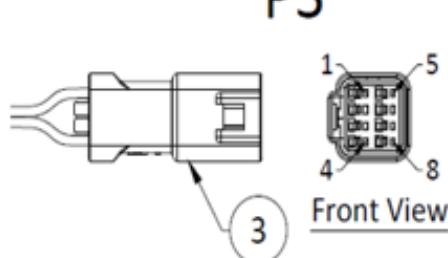
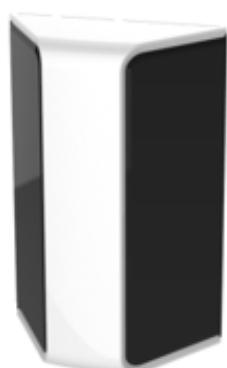
Maximum power modes	FCC/NCC: 19 CE: 23.87	FCC/NCC: 25 CE: 29.84	dBm
Minimum power modes	FCC/NCC: 19 CE: 23.87	FCC/NCC: 25 CE: 29.84	dBm
Power duty cycle	4.25	4.25	%

## 4 Product Dimension

The Side Radar product dimension is 106(L) x 86.3(W) x 44(H) mm (with connector)



## 5 Connector Definition

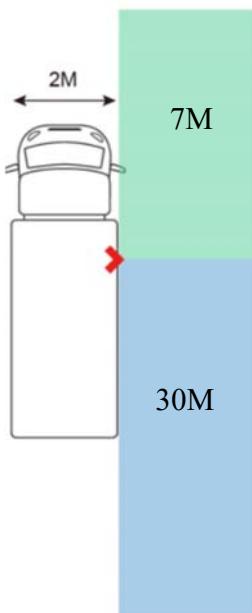


Radar output		
Pin assignment		
P3	Color	Signal
1	Red	12V
2	N/A	-
3	N/A	-
4	White	CAN_H
5	Black	GND
6	N/A	-
7	N/A	-
8	Blue	CAN_L

## 6 Radar Detection Zone

Functions comply with existing BSIS & BSD basic functions

(The range from 7m in front of the car to 30m behind the car, and the range from 0.9m to 4.25m in the lateral direction is regarded as the Detect Area. If there are moving objects in the detection area, a warning will be provided to the central control)



### Application

- Vehicle Type : Commercial Car / Truck/Bus
- Detection Zone (For Bicycle) : Radar front side 7m + Rear side 30m (UN R151 Criteria)
- Object Detection : Bike / Vehicle
- Installation Height : 80 ~ 100 cm
- Object speed limited : Over 5 Km/h
- Interface : CAN
- Input Voltage : 9 ~ 16 V

## 7 Radar Setup

- Installation Height:  
The preferred installation center height is 80~100cm. If the height is too low, the signal may be affected by the reflection of the ground due to the static object detection function. If the height is too high, the object reflection will be poor, which will affect the radar detection performance.
- Mounting Angle:  
Radar mounting angle should form a perpendicular line to the ground.
- Installation Precautions:
  - There should be no metal objects within 80cm in front of the radar, it is also recommended that there should be no plastic object thicker than the radar to be placed in front of the radar, or false reading may occur.
  - There should be no objects or body structures higher than the radar above and below the radar.
  - The radar should be secured fasten on to the car body to avoid vibrations related to the radar and the car body.

## 8 Check & Review List

Check point number	Scheduled completion time	Check point content (Technical indicators/product Specifications/Quality indicators/Market test indicators)
A2.1	112/6	Output: Electronic architecture block diagram of BSIS/Side radar product (Including: antenna, RF, motherboard I/O interface input and output, power supply)
A2.2	112/9	Output: Specifications for BSIS/Side radar products
A2.3	113/6	<p>Output: Side 77GHz Radar Specification Verification</p> <p>1. Antenna frequency: &gt;76 to 77GHz</p> <p>2. Antenna gain: Front side&gt;10dBi / Rear side&gt;16dBi</p> <p>3. Antenna angle: Front Side=100° / Rear Side=40°</p> <p>4. Radar update rate: &lt;150ms</p> <p>5. Radar Power consumption: &lt;20W</p> <p>6. Radar Detection distance Car/Bus &gt;=10M Front, &gt;=30M Rear</p> <p>7. Main components comply with automotive specifications</p> <p>8. FCC Part95M test (966 chamber)</p> <p>9. R151 Test Criteria (7 Case Scenario)</p> <p>Key technologies: 77GHz radar hardware, RF and antenna design</p>
A2.4	113/12	<p>Output: Radar test report</p> <p>Specifications: Comply with ISO-16750-3, 16750-4, IPX9K</p> <p>ISO 16750-3 :</p> <p>4.1 Vibration</p> <p>4.2 Mechanical shock</p> <p>4.3 Free fall</p> <p>ISO16750-4 :</p> <p>5.2 Temperature step test</p> <p>5.5 Salt spray</p> <p>5.10 Dust test</p>

## 9 Regulations

### 9.1 EU Declaration of Conformity

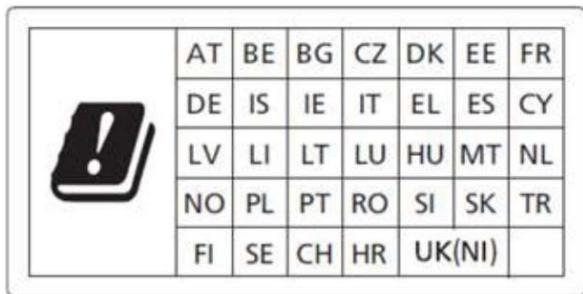
EU: Radio Equipment Directive (Directive 2014/53/EU)

Simplified EU Declaration of Conformity

Alpha Networks Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

Full text of EU declaration of conformity is available at <https://www.alphanetworks.com>

77G Side Radar for outdoor use only



### 9.2 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.

### 9.3 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。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

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。

【須經專業工程人員安裝及設定，始得設置使用，且不得直接販售給一般消費者。】

## 10 Company Information

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