ALPHA
ARS-DG01

ARS-DG01 ECULess
79GHz mmWave Radar Sensor
Data Sheet
(For RCW Application)

Version: 1.2

Approved by	Checked by	Department	Prepared by
		MES	

Revision History

Date	Release	Author	Description
2020/07/03	0.1	Vic Wu	Initial Draft
2020/11/23	0.2	Vic Wu	Modified to the new spec.
2020/12/01	0.3	Vic Wu	Modified to the product dimension.
2021/01/28	0.4	Vic Wu	Modified to the scenario and pin define.
2021/02/04	0.5	Vic Wu	Modified to the scenario
2021/02/09	0.6	Vic Wu	Modified to the product dimension.
2021/07/07	0.7	Vic Wu	Modified to the scenario
2021/12/16	0.8	Vic Wu	Modified to the 8+6NC pin spec.
2022/04/08	0.9	William Lee	Add Cable Pin Define
2022/04/08	1.0	Kent Huang	Modified housing dimension.
2022/07/13	1.1	Dean Chiu	Modified Application and remove Pin Define
2022/11/02	1.2	Evan Dang	Delete System Block Diagram and modification operating frequency

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1. Product Description

The ARS-DG01 product is an integrated FMCW radar sensor capable of operation in the 79GHz band. The radar sensor's main task is to detect objects and measure their speed and position relative to the movement of the vehicle in which it is fitted. When driving on the road, the motorcycle's blind spot – the area just behind the motorcycle – is a constant source of danger and often the cause of serious accidents. Alpha has developed the Rear Collision Warning (RCW) solution - the RCW system product. The RCW system product is a cost-effective and all in one solution suited to all motorcycle segments. It consists of one mid-range Radar. The Rear Spot Detection works by using one mid-range radar sensors on the motorcycle. Powerful control software collates the sensor information to create a complete picture of all traffic in the area behind the motorcycle. Whenever another vehicle approaches at speed from behind or is already present in the blind spot, a warning LED light in the side mirror alerts the driver to the hazard. With Alpha's Blind Spot Detection solution, accidents that happen while changing lanes can be prevented.

2. Features

- 79 GHz Short Range Radar suited to Rear Collision Warning (RCW) applications
- Detects approaching objects
- Simultaneous Doppler and FMCW processing whilst fast-scanning (no mode change required)
- Self- calibration function reduces fitting cost
- Low power consumption and high reliability
- Small size for easy integration into the motorcycle
- Capable of detection of rearward vehicles up to 25m for RCW.
- Programmable alert zones for different motorcycle types, models, and functions
- ARS-DG01 operates in 12 volts

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3. Specification

Parameter	Value	Unit
Radar Characteristics		
Operating frequency	78.1~78.58G	GHz
Power Supply	12	V DC
Power Supply (A)@12V	0.126	A
Peak Power Supply (A)@12V	0.367	A
Distance measurement	RCW : 25	m
Speed measurement	-5...+70	kph
FOV	100	deg
Distance measurement accuracy	0.5	m
Speed measurement accuracy	2	kph
Angle measurement accuracy	1.5	deg
Object separation capability - Distance	0.37	m
Object separation capability - Speed	1	kph
Object separation capability - Angle	10.87	deg
Emitted radar power (EIRP)	22.3	dBm
Update time	100	ms
Normal Power consumption	1.1512	W
Voltage surge power consumption	4.404	W
Mechanical size (with connector)	49(L) x 53(W) x 38.75(H)	mm
Mounting area	vertically : between 60~80cm above road surface level	
Temperature range	operating : -40~ +85	°C
	storage: -40~ +90	°C
Shock	ISO 16750-4.2.2	
Vibration	ISO 16750-3.4.1.3.1.5 ISO 16750-3.4.1.3.2.3	
Protection rating (Mating connector)	IP67	

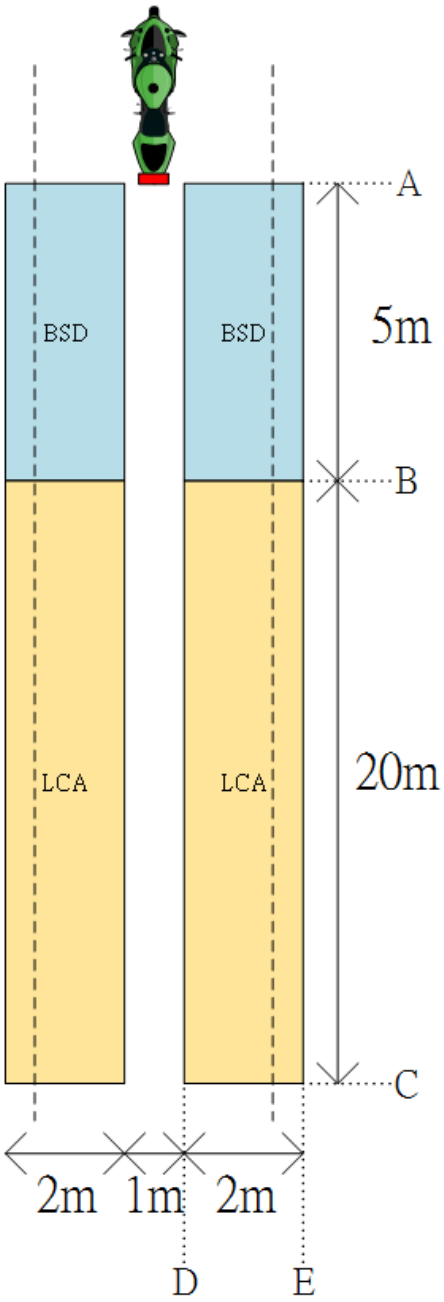
4. Application

- **RCW radar system start conditions:**
  ACC ON

- **LED warning mode:**
  Lighting
  No light

- **Radar update time:**
  100ms

- **79GHz RCW radar detection behavior:**



1. BSD Start condition:
   a. When the target enters between A and B segments
   b. When the target enters between D and E segments
   c. The target is approaching at a relative speed of 4km / hr
2. LCA Start condition:
   a. When the target enters between B and C segments
   b. When the target enters between D and E segments
   c, TTC is less than 3 seconds

4. Warning distance
   a. Relative velocity≤ 6km/h: 5m
   b. 30 km/h > Relative velocity > 6 km/h : 5~25m

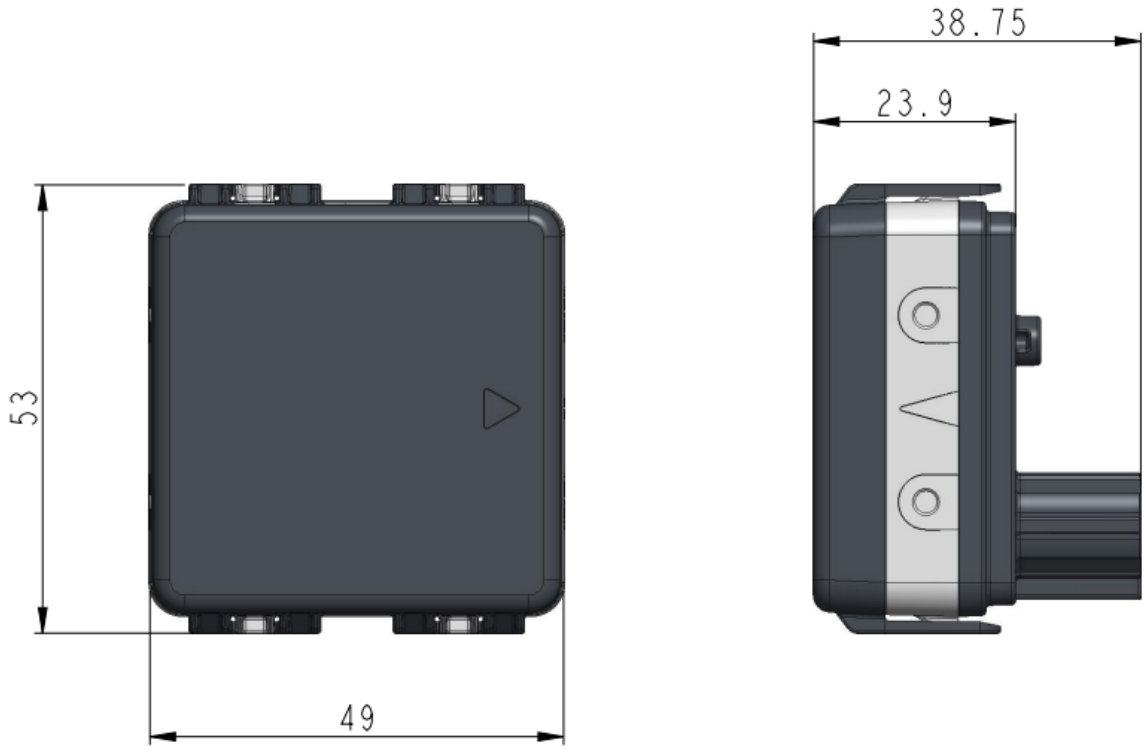
Warning distanc = Relative velocity ÷ 3.6 × 3

Relative velocity (Km/h)	Warning distance (m)
6	5
12	10
18	15
24	20
30	25

   c. Relative velocity≥30 km/h: 25m

5. Product Dimension

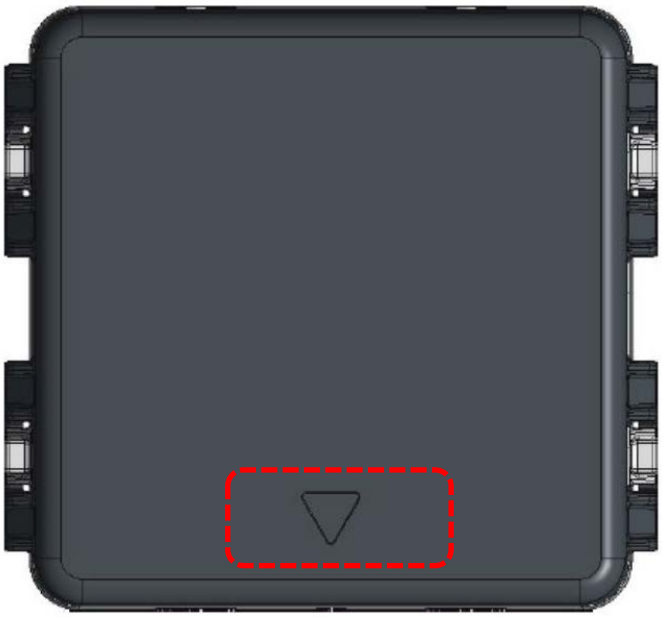
The ARS-DG01 product dimension is 49(L) x 53(W) x 38.75(H) mm (with connector).
Radar weight: 62.8 g/ per pcs



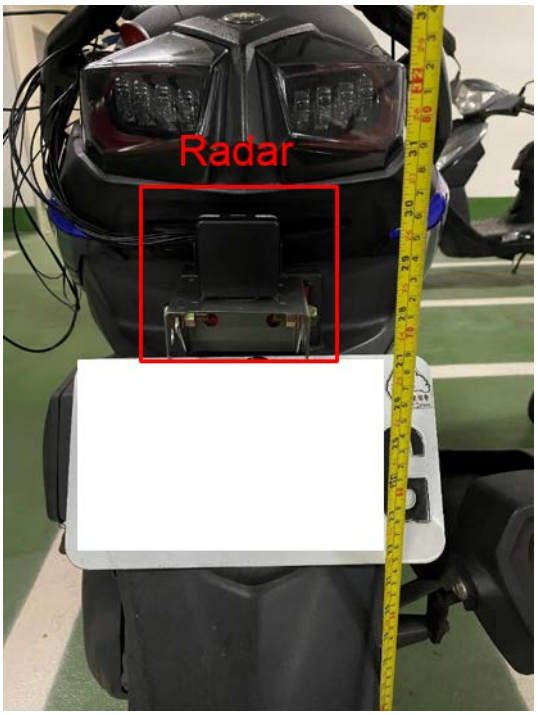
6. Radar Setup

In order for the radar evaluation, the system needs to be setup properly. To fulfill the Rear Collision Warning (RCW) application, we recommend the radar product to behind the motorcycle, and mounted between 60~80cm above the road surface level, vertically, at a certain squint angel.

When installing the radar sensor on the rear of the motorcycle, the indicator should face down.

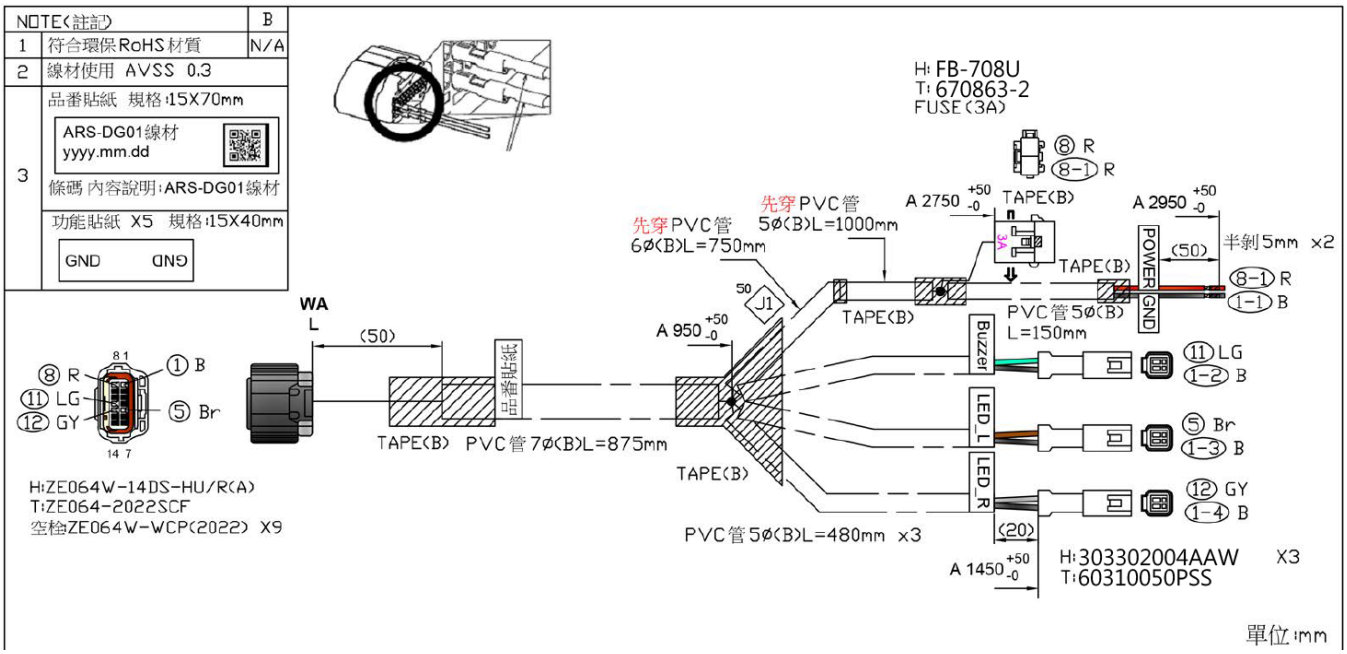


7. Test Environment



8. Cable Pin Define

NO.	Function/ARS-DG01	Description	Color
Pin1	GND	Bare Wire	
Pin2	UART_RX	NC	
Pin3	UART_TX	NC	
Pin4	DL	NC	
Pin5	LED_L	Connector	
Pin6	SPEED	NC	
Pin7	PARK	NC	
Pin8	PWR	Bare Wire	
Pin9	TRIG_R	NC	
Pin10	TRIG_L	NC	
Pin11	BUZZER	Connector	
Pin12	LED_R	Connector	
Pin13	REV	NC	
Pin14	ACC	NC	



IMPORTANT NOTE:

FCC 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.

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。

車用、移動式或固定式無線接取終端設備警語內容:「電波功率密度 MPE 標準值: 1.00 mW/cm2,
送測產品實體值: 0.023 mW/cm2，建議使用時設備天線至少距離人體 20 公分.
並請標示於設備外包裝及使用說明書上標明,謝謝.

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 Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.