

Product Specification: RETINA-4FN Imaging Radar



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1. Overview

1.1 General Description

The RETINA (Radar Enabled True Imaging by Neural Analysis)-4FN is 4D (X, Y, Z, Velocity) Imaging Radar implements automotive and industrial grade requirements for solution application allowing to precisely collect the distance and velocity information of target objects not only horizontally, but also vertically with single module. RETINA-4FN beams radio-electric waves and analyzes the reflected waves to detect objects in front and to get the 4D information of the objects. The radio-electric wave works well even in the bad environmental challenges, such as fog, smoke, rain, snow, night, flare, and dust. Detection that involves any moving objects such as car, drone, robot, airplane, ship and/or boat. Needs to factor in the surrounding environment precisely under any challenging circumstances in order to gather most valid result of detection. The RETINA-4FN by Smart Radar System is the ideal solution for various use cases to supplement any existing sensors or other unrecognized applications. RETINA-4FN utilizes 4 multi-chip system to distinguish objects.

1.2 Features

- Innovative 4D Imaging Radar Product
- Targeting ADAS / Autonomous driving
- 77-81 GHz FMCW Radar
- Built-in Automotive 1000BASE-T1 Ethernet Transceiver
- Built-in CAN FD transceiver

1.3 Product Appearance



2. Product

2.1 Performance Specifications

Category		Description	
Frequency		77 ~ 79 GHz	
Mode		Long range	Short range
Range	Maximum Detection Range	Car: 250m	Car: 100m Man:50m
	Range Resolution	1.40m	0.46m
Doppler	Maximum Doppler Ambiguity	±280km/h	±280km/h
	Doppler Resolution	0.161km/h	0.167km/h
Angle	Azimuth FOV	100°(±50°), 30°(±15°) @250m	100°(±50°)
	Azimuth Angle Resolution	2.0°	2.0°
	Elevation FOV	24°(±12°), TBD @250m	24°(±12°)
	Elevation Angle Resolution	4.7°	4.7°
Point Cloud Output (per frame)		Yes (Max. 3,000)	
Update Rate		50ms	
Output Data Interface		1000BASE-T1 Ethernet x 1	
Vehicle Data Interface		CAN FD x 1	

※ Specifications in this datasheet are subject to change without notice.

2.2 Operating Conditions

Category	Description	Notes
Main Power Supply	Typ. 12V	
Power Consumption	Avg. <25W, Peak <30W	
Operating Temperature	-40 ~ +85 °C	
Storage Temperature	-40 ~ +105 °C	
Protection Rating	IP67	

2.3 Connections



Description	Name	Pin number		Name	Description
1000BASE-T1	MX_TD+	1	7	CAN_H1	CAN FD
	MX_TD-	2	8	CAN_L1	
For Debug	UART1_TX	3	9	UART1_RX	For Debug
	GND	4	10	GND	
		5	11		
POWER	VIN_12V	6	12	VIN_12V	POWER

- ※ Connector: MX23A12NF1 by JAE Electronics
- ※ CAN Termination Resistor(120Ω): Not mounted on product

2.4 Mechanical Specifications

Category	Description	Notes
Dimension	147.3 x 121.5 x 37.0 (mm)	W x L x H (mm)
Weight	< 535g	

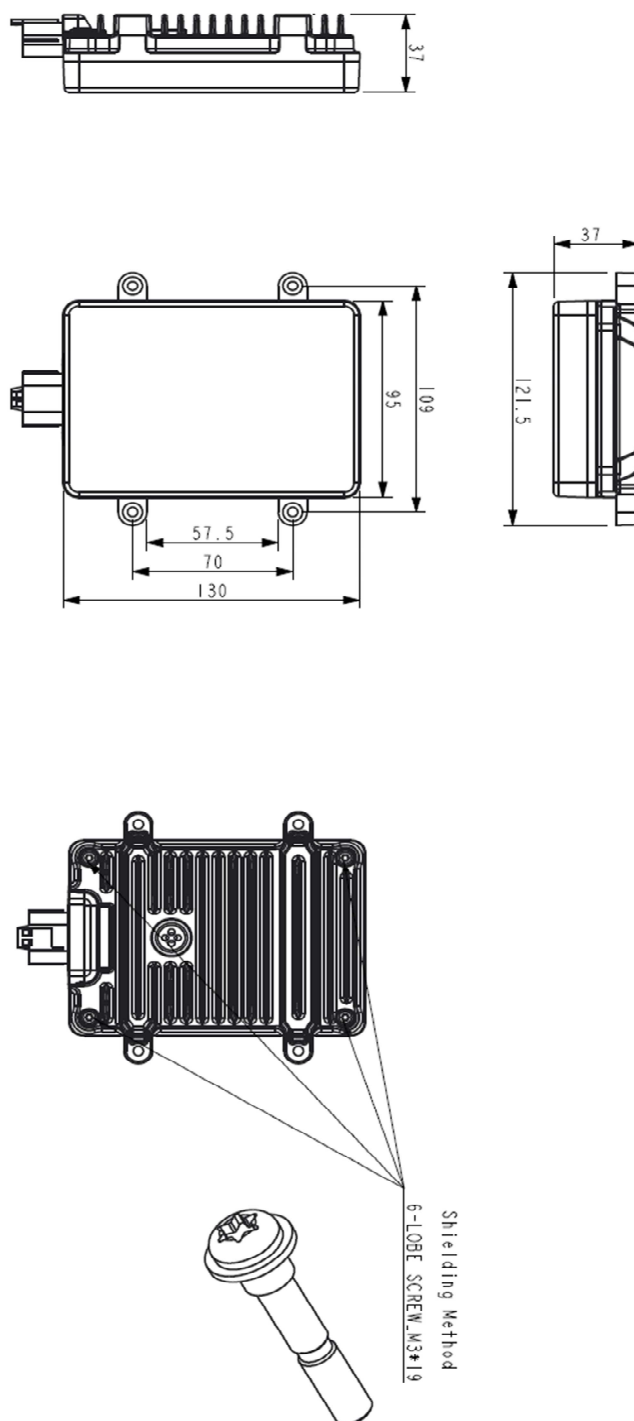


Figure 1. Mechanical Size

2.5 Data Protocol

Sensor output data can be transmitted to the host system using Ethernet and CAN protocols.

2.5.1 Ethernet

- o Speed: 1Gbps, 1000BASE-T1 Ethernet
- o Network Ports
 - 29172: Data Output Port
 - 9000: Command Receiving (Rx) Port
 - 9001: Command Transmitting (Tx) Port

MAIN HEADER							
1	2	3	4	5	6	7	8
Magic Word (0x0102030405060708)							
Protocol Version (UInt32 excluding '.')				Header Size (4 bytes)			
Payload Size (UInt32)				Antenna Model (0x00~0x3F : 4 Chip) (0x40 ~ : 2 Chip)			
SBL Version (UInt32 excluding '.')				Firmware Version (UInt32 excluding '.')			
Serial Number (ASCII)							
reserved 0 (128 bytes)							

PAYLOAD																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Frame Counter (UInt32)				Time Stamp (UInt64, usec 단위)								Target Info Format Type 0x00: Index format 0x01: Polar format 0x02: Cartesian format				Target number maximum 6144			
Payload Header Size				Reserved (16 bytes)															
Range Index (Int32)				Azim Index(Int32)				Elev Index(Int32)				Doppler index (Int32)				Power (UInt32)			
Range Index (Int32)				Azim Index(Int32)				Elev Index(Int32)				Doppler index (Int32)				Power (UInt32)			
Range Index (Int32)				Azim Index(Int32)				Elev Index(Int32)				Doppler index (Int32)				Power (UInt32)			
Ragne (float) [m]				Azim Angle (float) [rad]				Elev Angle (float) [rad]				Doppler (float)				Power (float)			
Ragne (float) [m]				Azim Angle (float) [rad]				Elev Angle (float) [rad]				Doppler (float)				Power (float)			
Ragne (float) [m]				Azim Angle (float) [rad]				Elev Angle (float) [rad]				Doppler (float)				Power (float)			
X Axis (float) [m]				Y Axis (float) [m]				Z Axis (float) [m]				Doppler (float)				Power (float)			
X Axis (float) [m]				Y Axis (float) [m]				Z Axis (float) [m]				Doppler (float)				Power (float)			
X Axis (float) [m]				Y Axis (float) [m]				Z Axis (float) [m]				Doppler (float)				Power (float)			

2.5.2 CAN FD

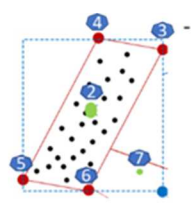
CAN-ID	Type	DLC	Data	Cycle Time	Count
072h	FD	1	60	872.8	794
630h	FD	10	00 F6 24 FF 00 FD 2D F4 31 EF 1C F3 1A F3 1A 00	127.0	5499

CAN FD Alive Message(Base ID 070h)

- Message Size : 1 Byte
- Message Data : Counter Number

CAN FD Points Info Message (Base ID : 610h)

- CAN ID : Base ID + Numbering of target
- Message Size : 15 Bytes
- Message Data :
 - ① : Track ID
 - ② : Representative Point(4 bytes. (x, y, z, doppler))
 - ③ : Rightmost Point (2 bytes. (x, y))
 - ④ : Uppermost Point(2 bytes. (x, y))
 - ⑤ : Leftmost Point(2 bytes. (x, y))
 - ⑥ : Lowermost Point(2 bytes. (x, y))
 - ⑦ : Closest Point(2 bytes. (x, y))



※ Data output format can be changed according to customer's request.

3. Notice

3.1 FCC

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.

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device should be installed and operated with minimum 20 cm between the radiator and your body.