24 GHz NB Radar Sensor

User Manual

Product Model: NB24G175V3

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1 Abbreviations

1.1 List of Terminology and Acronyms

BSD   Blind Spot Detection
CAN   Controller Area Network
DSP   Digital Signal Processor
EMC   ElectroMagnetic Compliance (regulatory standards)
FM   Frequency Modulation
GHZ   Giga-Hertz (10^9)
HP   Host Processor
LCA   Lane Change Assist
MMIC   Monolithic Microwave Integrated Circuit
MCU   MicroController Unit
NB   Narrow Band
PCB   Printed Circuit Board
RADAR   RAdio Detection And Ranging
RCTA   Rear Cross Traffic Alert
RF   Radio Frequency (or Microwave)

2 Product Overview

2.1 Product Description

The products described here are part of a family of radars offered by Veoneer. They are intended for automotive use, operating in the 24.050 - 24.250GHz band.

The radars are integrated into a vehicle to enhance vehicle safety systems. They can be integrated as a standalone sensor or sensors, or as part of more complex system that also may include cameras, lidar, and other type of sensors to provide features like Automatic Cruise Control, Automatic Emergency Break, Free Space Detections and other Autonomous Driving functions.
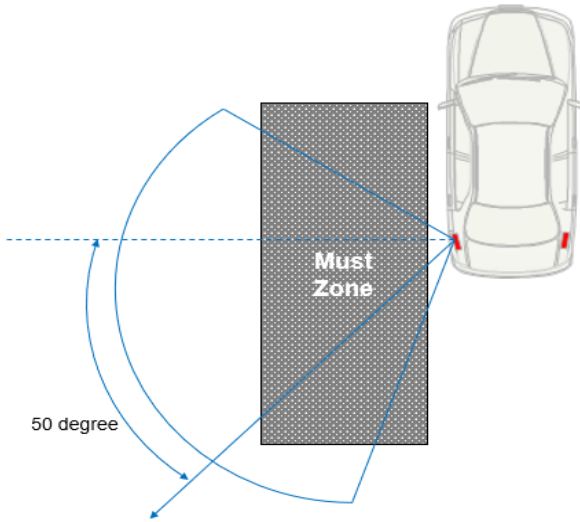
2.2 Product Application Examples

The product can be used, but is not limited to the following applications:

- Autonomous drive systems
- Automatic braking systems
- Collision prevention systems
- Cross Traffic Monitor system
- Blind Spot Detection system
- Lane Change Alert systems

3 Typical Installation

The radar is typically installed in the positions of the vehicle depicted in Figure 1 often mounted behind a bumper or emblem.

Figure 1: Typical Installation Positions

4 Hardware Description

The NB RADAR is a fully integrated 24GHz radar sensor with both RF and DSP modules on the same PCB. The design supports a combination of pulsed Doppler and chirped FM waveforms that can detect moving or stationary vehicles in a high clutter environment.

The sensor's DSP side controls all signal processing, diagnostics and communications and contains the sensor's two processors. The RF module generates, transmits, receives and demodulates radar signals using two Veoneer MMICs. Software algorithms calculate target parameters such as range, speed and angle, and make feature decisions that are sent out to the vehicle over the CAN bus.

The components are assembled into a plastic housing that is laser welded together. The sensor has no serviceable parts and can't be opened without permanent damage.
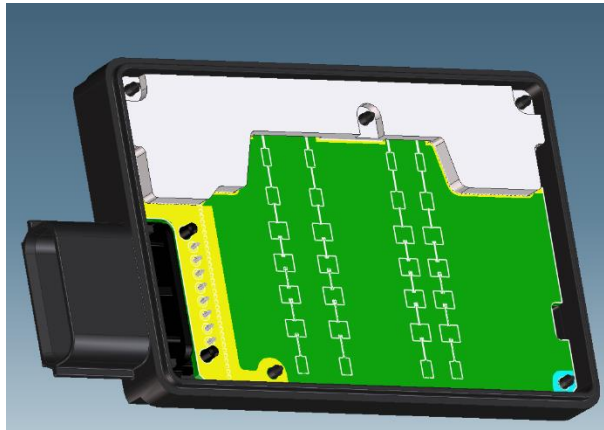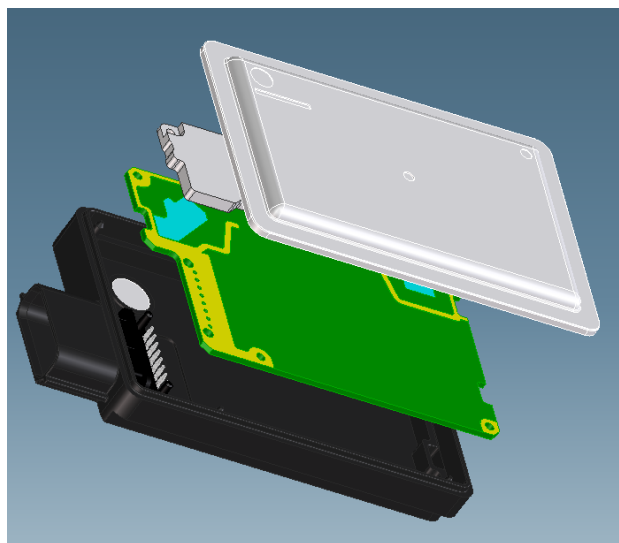

Figure 2: Generic Sensor

Figure 3: Sensor Exploded View

5 Sensor Generic Specifications

Sensor Specifications & Functions	Value	Unit
Operating Conditions		
Frequency Band	24.05 – 24.25	GHz
Power Dissipation	<5	W
Vehicle Network Interface	CAN2.0B	
Operating Temperature	-40C to +85	C
Input Operating Voltage	8 – 16	V
RF Output Power	13.5	dBm peak
Operating Life	15 years	
Waveform Parameters		
Cycle Time	80	ms
Bandwidth	<200	MHz
Physical Parameters		
Size	95x63x16.3	mm
Weight	<150	g
Vehicle Physical Interface	6 pin Yazaki connector	
Performance Parameters		
Detection Range for RCTA	2 – 60	m
Detection Range for BSD	.5 – 14	m
Detection Range for LCA	4 – 80	m
Field of View for RCTA	+/-65	degrees

6 Sensor Features

The BSD algorithm detects and reports "Objects of Interest" on either side of the vehicle, within a specified "blind spot" zone. The feature generates a signal which is used to drive a visual display placed in the outside view mirror to alert the driver to the presence of objects of interest within the defined SBZA zone.

The LCA algorithm detects and reports to the driver that a highway licensable vehicle is rapidly approaching the host vehicle in one of the adjacent lanes. The feature generates a signal which is used to drive a visual display placed in the outside view mirror and/or request a chime or vibrating seat cushion, to alert the driver to the approach of objects of interest within the defined LCA zone.

The RCTA algorithm detects and reports "Objects of Interest" behind the host vehicle, within a specified RCTA coverage zone. The feature generates a signal which is used to drive a visual display to alert the driver of the presence of objects of interest that may cause a collision with the host vehicle within the defined RCTA zone.

7 Conformance Statements

7.1 USA

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

Additionally, it should be mentioned, that the integrator is advised to have this statement in their user manual as well.

7.2 Canada

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) L'appareil ne doit pas produire de brouillage; 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

7.3 Europe

Hereby, Veoneer US, Inc declares that the radio equipment type NB24G175V3 is in compliance with Directive 2014/53/EU.

Operational frequency band: 24.050 – 24.250GHz

Maximum radio-frequency output power: < 13.5 dBm peak eirp

The full text of the EU declaration of conformity is available at the following internet address: https://www.veoneer.com/en/regulatory

8 Revision History

The revision number in table below is the PLM revision and version number. The Description/Comment is the same description that is found in PLM in check comment.

Revision	Date	Author(s)	Description/comment
000 v1	2020-01-13	Shobana R	Draft
000 v2	2020-01-17	Shobana R	Updated power dissipation and field of view values. Modified hardware description
000 v3	2020-01-21	Shobana R	Added EU conformance statement, abbreviations. Divided table in section 5 into groups and added RF output power.
000 v4	2020-04-01	C. ONeill	Updated bandwith, detection range for BSD