



# User Manual

**Model: 60ICSG10V0**  
60 GHz ICS Radar Sensor

# Table of Contents

<b>1</b>	<b><u>ABBREVIATIONS</u></b>	<b>3</b>
1.1	LIST OF TERMINOLOGY AND ACRONYMS	3
<b>2</b>	<b><u>PRODUCT / PROTOTYPE OVERVIEW</u></b>	<b>4</b>
2.1	PRODUCT DESCRIPTION	4
2.2	PRODUCT APPLICATION EXAMPLES	4
<b>3</b>	<b><u>TYPICAL INSTALLATION</u></b>	<b>5</b>
<b>4</b>	<b><u>HARDWARE DESCRIPTION</u></b>	<b>6</b>
<b>5</b>	<b><u>SENSOR SPECIFICATIONS</u></b>	<b>7</b>
5.1	GENERIC SPECIFICATIONS	7
<b>6</b>	<b><u>SENSOR FEATURES</u></b>	<b>8</b>
<b>7</b>	<b><u>CONFORMANCE STATEMENT</u></b>	<b>9</b>
7.1	USA	9
7.2	CANADA	9
7.3	E.U.	9
<b>8</b>	<b><u>REVISION HISTORY</u></b>	<b>10</b>

## List of Figures

FIGURE 1: TYPICAL INSTALLATION POSITIONS .....	5
FIGURE 2: GENERIC SENSOR SPECIFICATIONS .....	6

## List of Tables

TABLE 1: SENSOR SPECIFICATIONS .....	7
TABLE 2: REVISION HISTORY .....	10

# 1 Abbreviations

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## 1.1 List of Terminology and Acronyms

A/D	Analog to Digital Converter
ADC	Analog to Digital Converter
BSD	Blind Spot Detection
CAN	Controller Area Network
DSP	Digital Signal Processor
ECU	Electronic Control Unit (CAN bus Master located in the automobile)
EMC	Electro Magnetic Compliance (regulatory standards)
EPWM	Enhanced Pulse Width Modulation
ESD	Electrostatic Discharge
FM	Frequency Modulation
GHz	Giga-Hertz ( $10^9$ )
HP	Host Processor
ICAN	Internal Controller Area Network
IF	Intermediate Frequency
I/Q	In-phase / Quadrature (baseband demodulated signals)
ISM	Industrial Scientific Medical (EMC regulatory mode)
LCA	Lane Change Assist
LDO	Low Drop Out regulator
LNA	Low Noise amplifier
LO	Local Oscillator
MMIC	Monolithic Microwave Integrated Circuit
MCU	Micro Controller Unit
NB	Narrow Band
PCB	Printed Circuit Board
PLL	Phase Lock Loop
PWM	Pulse Width Modulation
RADAR	Radio Detection and Ranging
RCTA	Rear Cross Traffic Alert
RF	Radio Frequency (or Microwave)
RX	Receive
SPI	Serial Peripheral Interface
TBD	To Be Decided (not presently specified)
TX	Transmit
VCAN	Vehicle Controller Area Network
VGA	Variable Gain amplifier

## 2 Product / Prototype Overview

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### 2.1 Product Description

The products described here are part of a family of radars offered by Magna Electronics, US LLC. They are intended for automotive use, operating in the 60-64 GHz 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 such as Child Presence Detection, Seat Belt Reminder, and Intruder Detection.

### 2.2 Product Application Examples

The product can be used to support following applications among others:

- **Child Presence Detection (CPD)** - The CPD algorithm detects, and reports is a child has been left alone inside the vehicle with no adult present. The feature generates an output a signal on the CAN Bus.
- **Seat Belt Reminder (SBR)** - The SBR algorithm detects and reports all the occupants in seats within the vehicle. This information is combined with seat belt status to report to the driver if an occupant does not have their seat belt buckled.
- **Intruder Detection (Intruder)** - The Intruder algorithm detects and reports if someone has tried to gain access to the vehicle or broken into the vehicle.

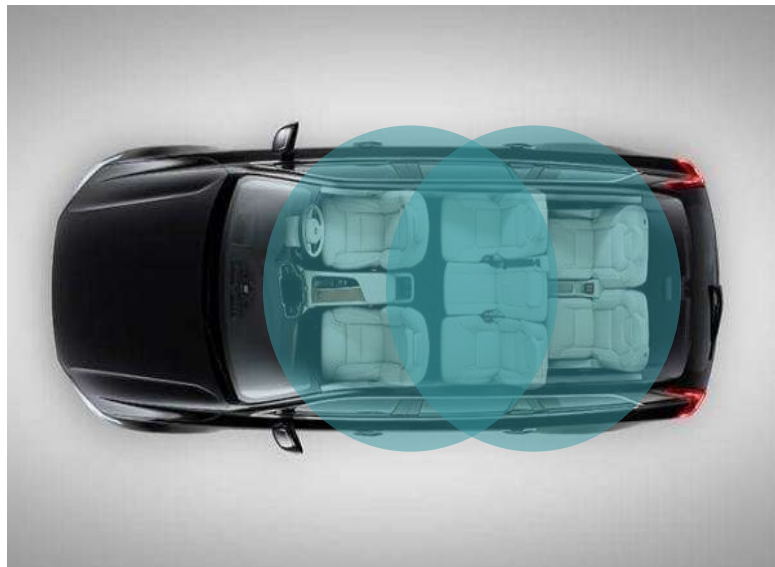
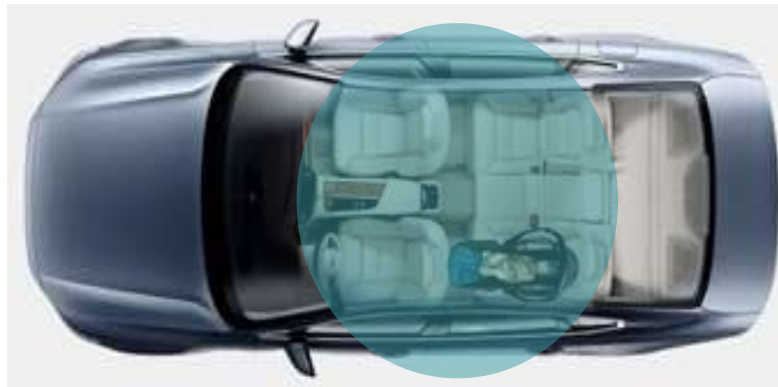
The product can be used but is not limited to the following applications.

- Occupant Position Classification
- Pre/Post Crash Occupant Status
- Truck Bed Intrusion
- Animal Classification
- Airbag Suppression

### 3 Typical Installation

The radar is typically installed in the positions of the vehicle depicted in Figure 1 often mounted on the body of the vehicle facing inside of the vehicle cabin.

ICS



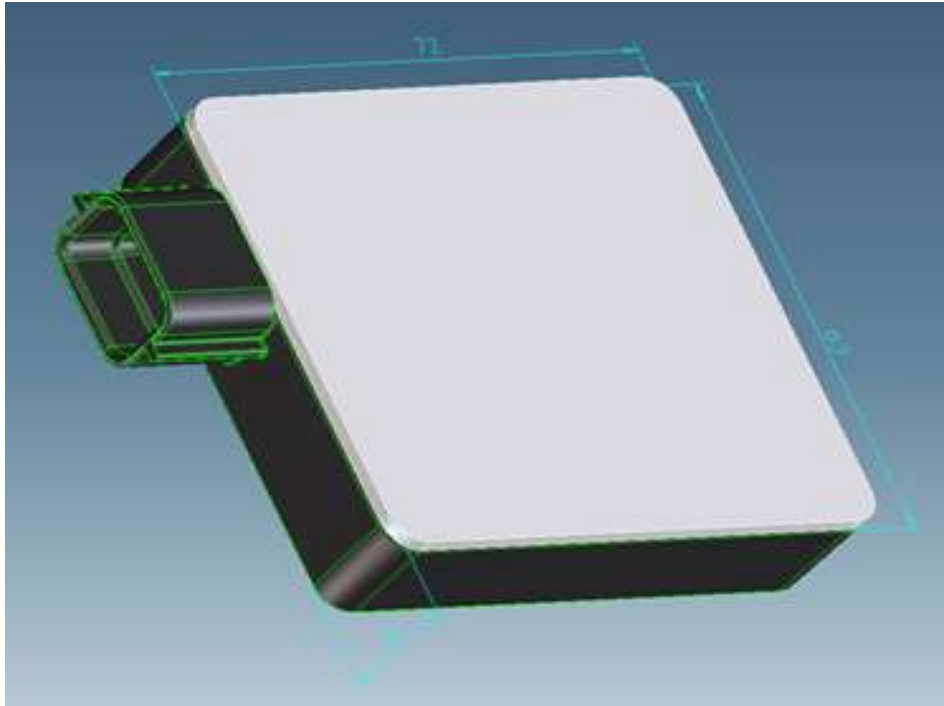
**Figure 1: Typical Installation Positions**

## 4 Hardware Description

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The radar assembly consists of 1 PCB board containing all the RF components, antennas, analog to digital converters, and necessary components for signal processing and communications with the vehicle and power

The board is assembled in to a plastic housing that is laser welded together. The sensor has no servisable parts and can't be opened without permanent damage.



**Figure 2: Generic Sensor Specifications**

## 5 Sensor Specifications

### 5.1 Generic Specifications

Sensor Specifications & Functions	Value	Unit
<b>Sensor</b>		
Input Operating Voltage	8 - 16 (12VDC nominal)	V
Max Power Dissipation	5	W
Operating Temperature	-40 to 85	°C
Size (Without Connector)	72x63x19	mm
Weight	<120	g
Vehicle Physical Interface	2x4 Nano MQS	
Vehicle Interface	CAN/CAN-FD	
<b>DSP</b>		
Cycle Time	50	ms
MCU Reference Clock	25	MHz
<b>RF</b>		
Frequency Band	60-64	GHz
Waveform	FMCW	
ITU Emissions Designator	4G00P0N	
Number of Antenna Channels	7	
- Transmit	3	
- Receive	4	
Max. EIRP (Transmit Output Power)	Tx1+Tx2 + Tx3: 12	dBm
Antenna Polarization	Vertical	
Return Loss at Antenna Port	-9	dB
Antenna Impedance	50	Ω
Number of Parallel Receiver Channels to the ADC	4	
Rated TX power – EIRP	+11.0 (nominal EIRP)	dBm

**Table 1: Sensor specifications**

## 6 Sensor Features

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The Product name / Part number in scope, can be used to support following applications among others mentioned in the **Euro NCAP** and **US hot car** regulations:

- **Child Presence Detection (CPD)** - Child Presence Detection (CPD) function shall warn the vehicle owner and surroundings that a child is left in the back seat.
- **Child Presence Alert (CPA)** – Notifies / warns the vehicle owner and surroundings and alerts to save the life when a child is left in the back seat.



## 7 CONFORMANCE STATEMENT

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### 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.

### 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 E.U.

Simplified Declaration of Conformity – RE Directive 2014/53/EU

Hereby, Magna Electronics, LLC declares that the radio equipment type 60ICSG10V0 is following Directive 2014/53/EU.

The full text of the EU declaration of conformity will be made available at the following internet address: <https://www.veoneer.com/en/regulatory> or <https://www.magna.com/type-approval>.

Manufacturer:	Magna Electronics, LLC
Address:	26360 American Drive, Southfield, Michigan, 48034, USA
Model:	60ICSG10V0
Operation frequency:	60 - 64GHz
Maximum Output Power:	Less than 20 dBm peak EIRP

## 8 Revision History

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The document revisions are listed in Table 2:

Revision	Date	Author(s)	Description/comment
000 v1	2023-07-05	Harsha Deshpande	Initial Release

**Table 2: Revision history**

Magna Electronics, LLC  
26360 American Drive  
Southfield, Michigan 48034  
USA

Phone: +1-248-223-0600  
Fax: +1-248-223-8833  
<http://www.magna.com>