**Speed Monitor powered by 24GHz radar**

**How to build**

**About this document**

**Scope and purpose**

This Application Note is intended to enable users to build a speed monitor combining the Infineon Demo Sense2GoL 24GHz radar evaluationboard with an XMC2Go microcontroller.
Table of contents

About this document........................................................................................................................................ 1
Table of contents............................................................................................................................................... 2
1 Laser Cutting .................................................................................................................................................. 3
2 Display......................................................................................................................................................... 4
3 Hardware assembly ....................................................................................................................................... 5
4 System Setup................................................................................................................................................ 6
5 Electric connections ..................................................................................................................................... 7
6 Software ...................................................................................................................................................... 9
1 Laser Cutting

The wooden parts of the speed monitor are laser cutted. The cutter used works with raw material of up to 800x450mm. The parts are cut out of 3mm wood. You will need a piece of: 670mmx400mm (3mm)

The lines shown in red are cut lines, other colors will be engraved. Keep also the “lost” parts of the display as you will need them.

Figure 2 Lasercut layout
2 Display

For the display we used two 7-segment 6.5” displays as well as the suitable drivers. Desolder the “dots” of the displays, solder the drivers onto them and glue the displays in the wooden frame. Also glue the “lost” wooden parts into the inner space of the displays.

Figure 3 Display glued into the wooden frame
3 Hardware assembly

Glue the two 20x20mm pieces on top of each other. This stack is glued on the Sense2GoL board to keep a distance of about 6mm from antenna to the wooden enclosure.

![Distance pad on Sense2GoL](image)

Glue the Radar module centered underneath the Display (behind the Infineon logo), the 12 to 5V DCDC converter on the left and the XMC2Go on the right.

![Sense2GoL position](image)
4 System Setup

The system consists of five main parts:

- Sense2GoL radar module
- XMC2Go microcontroller
- Two 7-segment displays and drivers
- 12V->5V DC/DC converter
- Level shifter 3.3V -> 5V

The radar module is sending the speed information via a PWM interface to the XMC1100. The signal needs to be shifted as the Sense2GoL runs on a 3.3V logic level but the display drives work only with a 5V logic. The XMC controller then sets the display accordingly via a 3-wire interface (latch/clk/data).

Figure 6 System Setup
5 Electric connections

Connect the DC/DC converter to the power plug and the left display drivers GND, 5V and 12V.

![DC/DC power supply](image)

Figure 7 DC/DC power supply

Connect also the 5V and GND pins of the driverboard to the Sense2GoL.

![Sense2GoL power supply](image)

Figure 8 Sense2GoL power supply
Connect the drivers to each other as well as to the XMC2Go.

![Display driver and XMC2Go](image)

**Figure 9** Display driver and XMC2Go

Finally connect the Sense2GoL board to the XMC2Go

![Sense2GoL data connection](image)

**Figure 10** Sense2GoL data connection
6 Software

Flash the “S2GL_Doppler.hex” file onto the Sense2GoL and the “XMC1100_speed_monitor.ino.hex” to the XMC2GO.

The easiest way to do so is to use the XMC Flasher which is available via the Infineon Toolbox.

- Click on connect and choose the “XMC1302-0016” (S2GoL) or “XMC1100-0064” (XMC2Go)
- Select the .hex file and click on Program

![XMC Flasher](image)

Figure 11 XMC Flasher
## Revision history

<table>
<thead>
<tr>
<th>Document version</th>
<th>Date of release</th>
<th>Description of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1.0</td>
<td>23.08.2019</td>
<td>Initial release</td>
</tr>
</tbody>
</table>
IMPORTANT NOTICE
The information contained in this application note is given as a hint for the implementation of the product only and shall in no event be regarded as a description or warranty of a certain functionality, condition or quality of the product. Before implementation of the product, the recipient of this application note must verify any function and other technical information given herein in the real application. Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind (including without limitation warranties of non-infringement of intellectual property rights of any third party) with respect to any and all information given in this application note.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS
Due to technical requirements products may contain dangerous substances. For information on the type in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies’ products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.