EVM User's Guide: BP-IWRL6432WMOD

BP-IWRL6432WMOD Evaluation Board User's Guide

Description

The BP-IWRL6432WMOD from Texas Instruments is an easy-to-use low cost FR4-based evaluation board for the IWRL6432W integrated 60GHz mmWave sensor module. This Evaluation Module (EVM) contains everything required to evaluate and start developing software for the radar module. The EVM supports standalone operation as well as external MCU based connection using TI standard boosterpack connectors. The EVM also includes on-board buttons for module reset and LEDs for power and reset as well as dedicated LED for presence detection. There is one FTDI USB for demo and one XDS110 USB for uDFP patch update in the EVM.

Get Started

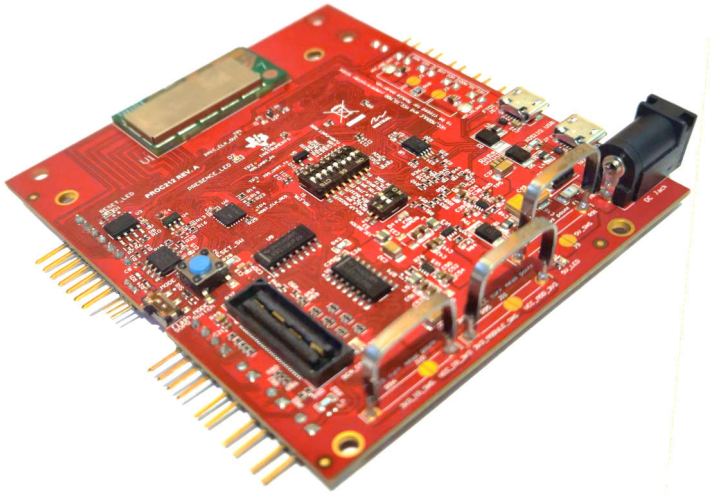
See the quick start guide to get started *Quick Start Guide*

Features

- 57 to 61.5GHz mmWave radar sensor module evaluation board
- Comes with IWRL6432WMOD, pre-installed
- On board power delivery network for module and other components
- 2-USB ports: FTDI (for demo), XDS110 (for uDFP patch updates)
- On board boosterpack connectors for external MCU based operation using TI standard launchpads
- Dedicated LED for presence detection

Applications

- Air conditioner
- Automated door/gate
- Gaming
- Home theater & entertainment
- IP network camera
- Occupancy detector
- PC/Notebooks
- Portable electronics
- Refrigerators and freezers
- Smart watches
- Tablets
- Televisions
- Thermostat
- Video doorbell



1 Evaluation Module Overview

1.1 Introduction

BP-IWRL6432WMOD is a boosterpack EVM for TI's first ever 60GHz mmWave sensor module - IWRL6432WMOD. The EVM features demo as well as all functional evaluation provisions of the mmWave sensor module.

1.2 Kit Contents

The kit contents are as follows:

- BP-IWRL6432WMOD
- Micro USB Cable (1m)
- Mounting screws
- EVM Quick Start Guide

1.3 Specification

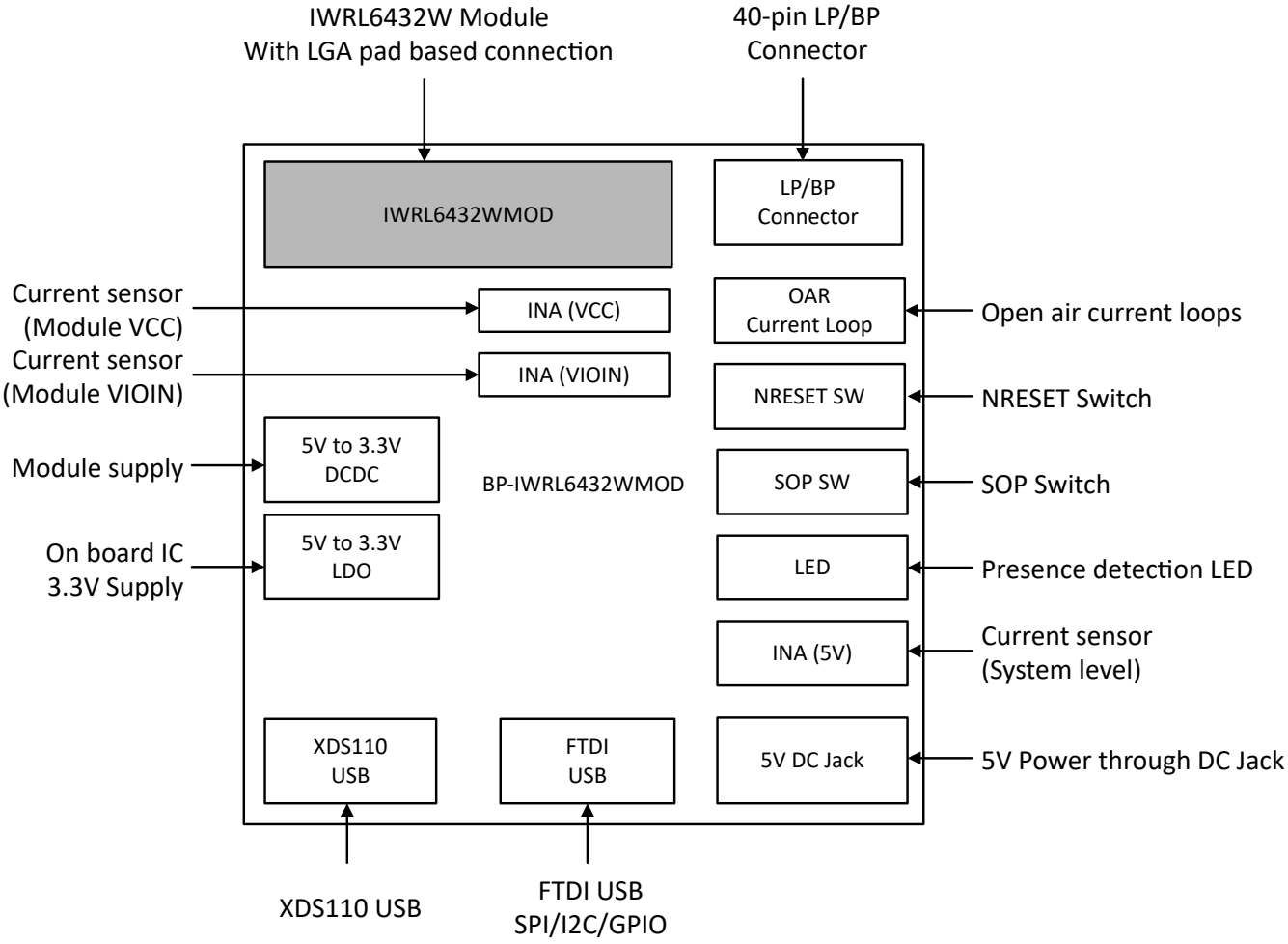


Figure 1-1. Functional Block Diagram

Figure 1-1 represents the functional block diagram of BP-IWRL6432WMOD.

The EVM interfaces with the Module using 30-pin Land Grid Array (LGA) pads. The primary communication interface for the module is SPI which is used for both configuring the module and outputting data in the TI demo. The SPI interface is available with the on-board FTDI chip via the USB port. The EVM supports standalone operation of the module using host PC with help of the FTDI USB. Using TI uDFP SDK package and its simple user interface, the module can be easily configured based on the detection sensitivity requirements.

The EVM also supports external MCU based connection using the boosterpack connectors available on the board. This helps integration with TI standard launchpads to communicate with external MCU for module configuration and detection data.

BP-IWRL6432WMOD features NRESET switch for easy module reset, a dedicated presence detection LED and an additional USB port with XDS110 interfacing to support uDFP patch updates.

Additionally the EVM features INAs for measuring power consumption at module level and at system level. For manual measurements, open air standard current loops are also present to support hall effect sensor based current measurement.

1.4 Device Information

TI IWRL6432WMOD is a complete system solution/module that is powered with TI IWRL6432W 60GHz mmWave sensor. This module operates in the frequency band of 57-61.5GHz (4.5GHz bandwidth) and with a single hardware design and simple API configuration it is capable of catering to applications that require presence and motion detection.

The IWRL6432WMOD is a simple ready to use and deployable solution for above usecases with below features:

1. Small size of 31mm (L) x 15mm (W) x 1.6mm (H)
2. Easy to mount LGA pad based module installation - 18 pad interface
3. Simple APIs (via SPI) to configure (Range, Sensitivity, Update rate) from an external MCU.
4. Presence and Motion detection indication via GPIO.
5. 2D Antenna etched on PCB with Field of View(FoV): ± 60° (Horizontal); ± 60° (Vertical)
6. Targeted modular certification with FCC, RED, TELEC certifications

2 Hardware

2.1 EVM Marking

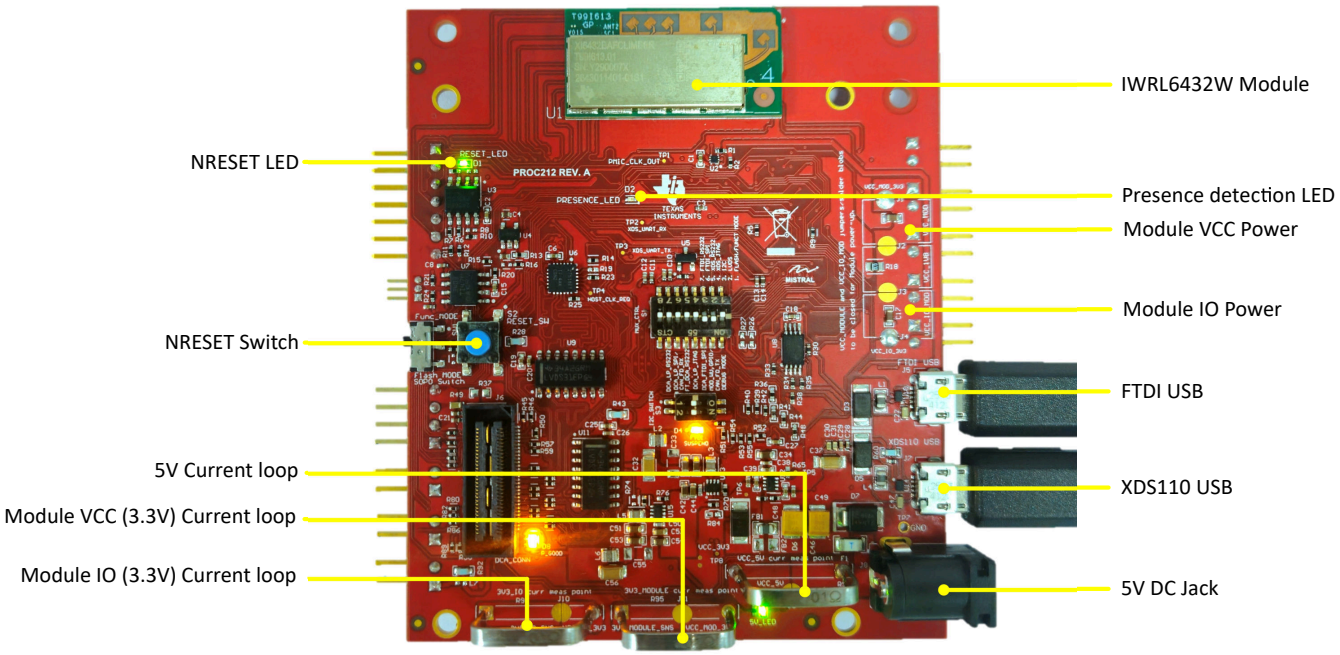


Figure 2-1. BP-IWRL6432WMOD - TOP

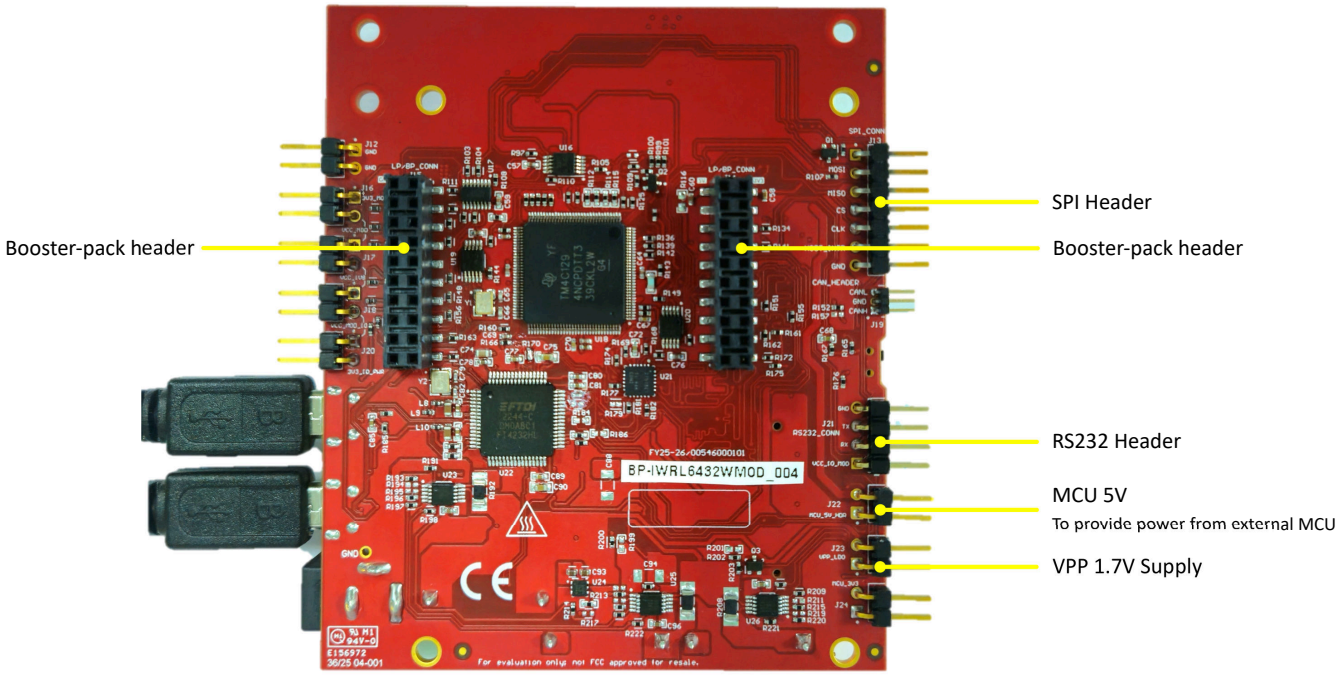


Figure 2-2. BP-IWRL6432WMOD - BOTTOM

2.2 Power Requirements

The EVM can be powered up using 5V supply. The 5V can be provided in different ways:

1. **USB:** The EVM can be powered up by any of the two USB ports with host PC.
2. **5V DC Jack:** The EVM can be powered up using the on-board 5V DC Jack.
3. **External MCU (Launchpad)**: The EVM can be powered using the boosterpack connectors from the external Launchpad. For this J22 needs to be closed.

Note

1. The 5V DC jack has precedence over any other 5V supplies. This is to ensure that the module power is not disrupted if the USB cables are disconnected with the 5V DC jack connected.
2. Other than USB if only DC jack or external launchpad based 5V supply is intended, it is recommended to follow the below sequence:
   a. Power up the EVM using any of the two USB cables
   b. Connect the 5V DC Jack or close J22 with external launchpad connected at the boosterpack headers
   c. Disconnect the USB power

2.3 Setup

2.3.1 TI Demo Set Up

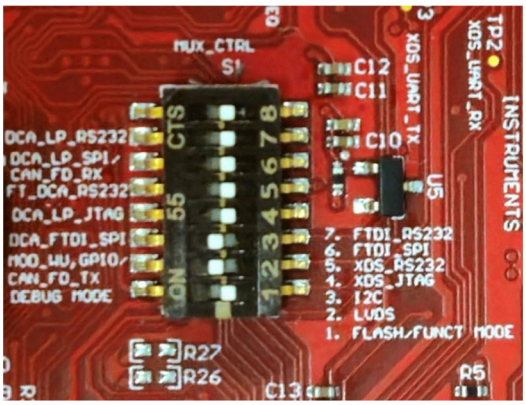


Figure 2-3. S1 - Switch settings for TI demo

To run TI demo, please follow the below steps:

1. Connect the EVM FTDI USB using the micro USB cable to host PC.
2. Make sure of the switch settings shown in Figure 2-3
3. Use TI mmWave uDFP visualizer to run the TI demo

For more information refer to the uDFP documentations mmWave uDFP

2.3.2 External MCU - Launch-pad Based Set Up

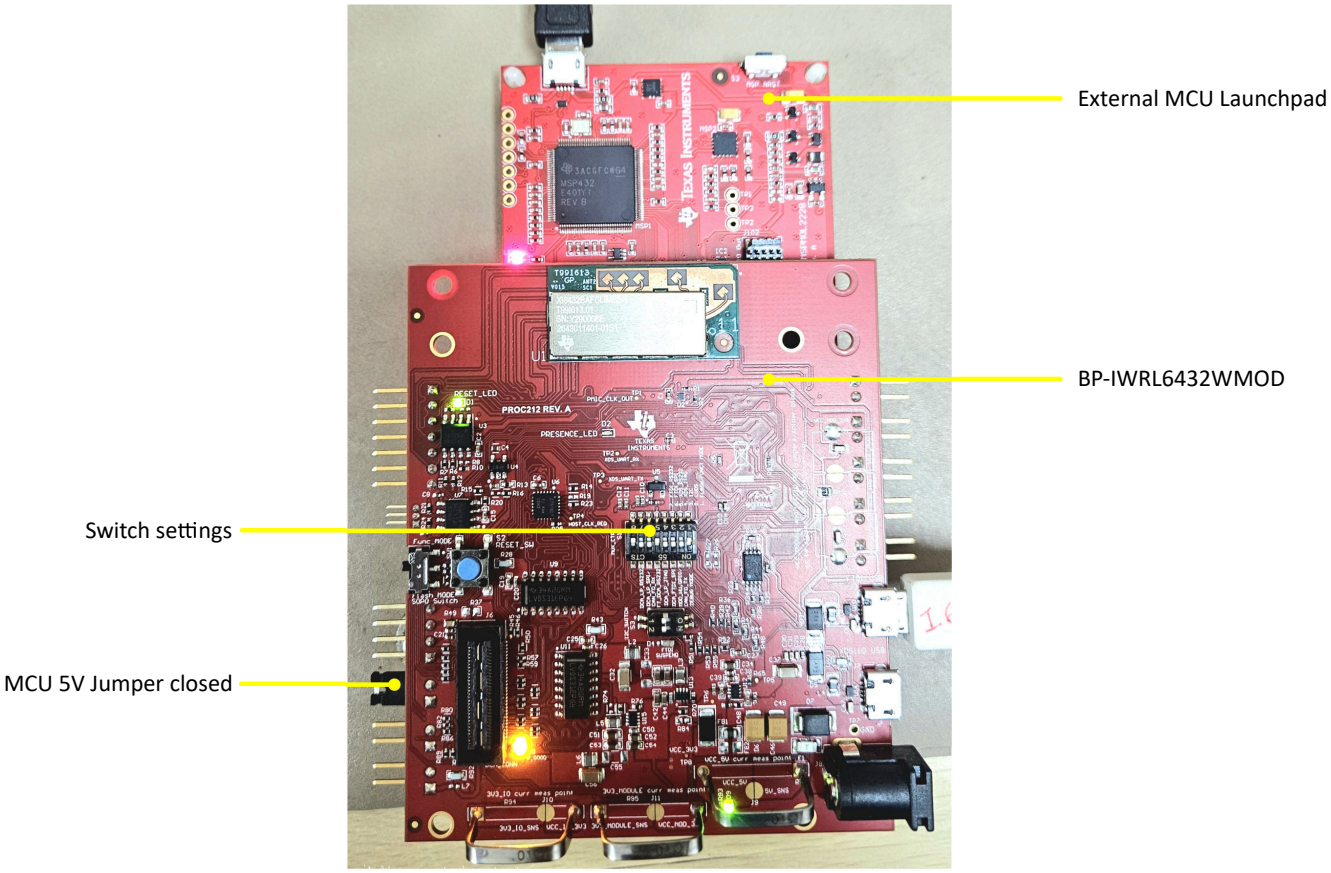


Figure 2-4. External MCU - Launchpad connection

To connect with external MCU - Launchpad, follow the steps:

1. Use the boosterpack connecters on the bottom side of the PCB to mate with the Launchpad headers
2. Make sure the pin-mapping is correct. Figure 2-6 depicts the connector details.

2.4 Header Information

2.4.1 SPI Header

SPI Header

J13 is the SPI header. To use J13 to access on board SPI S1 switch settings needs to be:

Table 2-1. S1 switch settings for using external SPI at J13

Switch	Position
S1.1	OFF
S1.2	ON
S1.3	ON
S1.4	OFF
S1.5	OFF
S1.6	ON
S1.7	OFF

2.4.2 Booster-pack Header

Boosterpack header

To use the boosterpack headers to connect with external launch pad the pin mapping needs to be made sure.

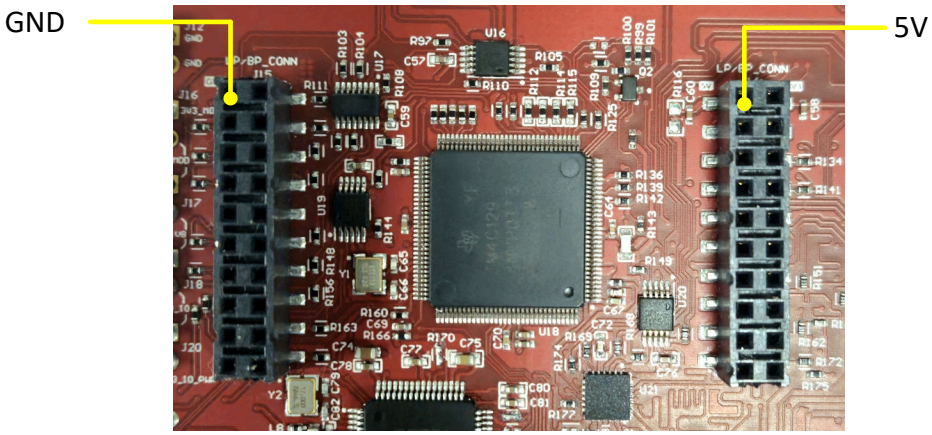
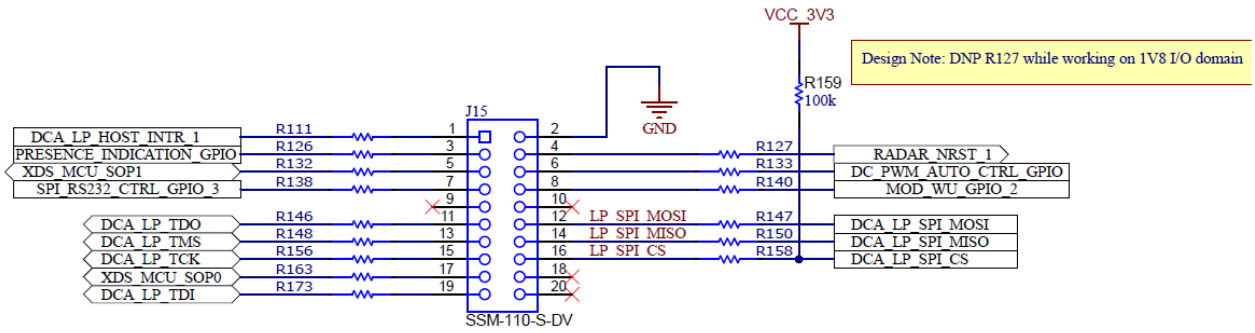
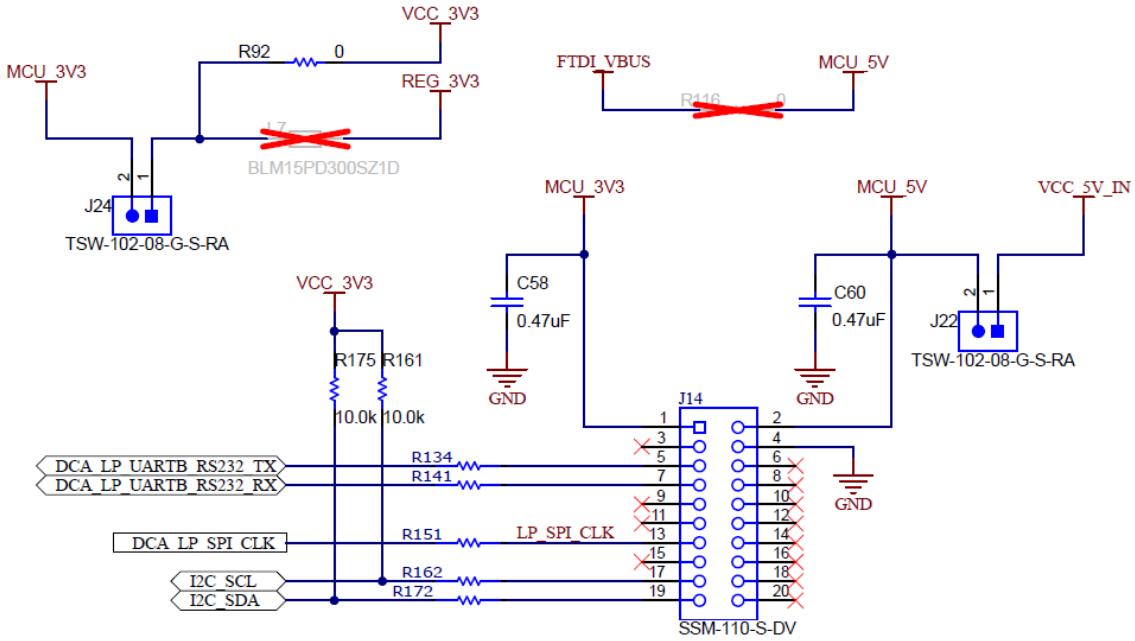


Figure 2-5. Booster-pack connector



J15



J14

Figure 2-6. Pin diagram - to be made sure at the launch pad pin assignment

2.5 Jumper Information

VCC_MODULE To provide core (VCC) power to Module any of solder jumper J1 or header jupmer J16 needs to be closed.

VCC_IO_MODULE To provide IO power to Module any of solder jumper J4 or header jumper J20 needs to closed.

Note

In the EVM, by default J1 and J4 are closed

2.6 Push Buttons

RESET Switch S2 is push button switch for device reset.

2.7 Interfaces

Demo: For demo the EVM features SPI interface at J5 USB

Debug and development: For debug and development the EVM has XDS110 USB at J7

External MCU - Launchpad: J14 and J15 are standard LP/BP connectors to connect with TI standard Launchpad eco-system.

2.8 uDFP Patch Update

For uDFP patch updates, EVM has XDS110 USB at J7 (Figure 2-1). For more information refer to the uDFP documentation mmWave uDFP

3 Software

3.1 Software Description

Download and install TI mmWave uDFP package from ti.com mmWave uDFP. Refer to the user guide at the location: <Installation folder>\mmWaveuDFP-0X_0X_0X_0X\Tools\Module_Visualizer_User_Guide.pdf

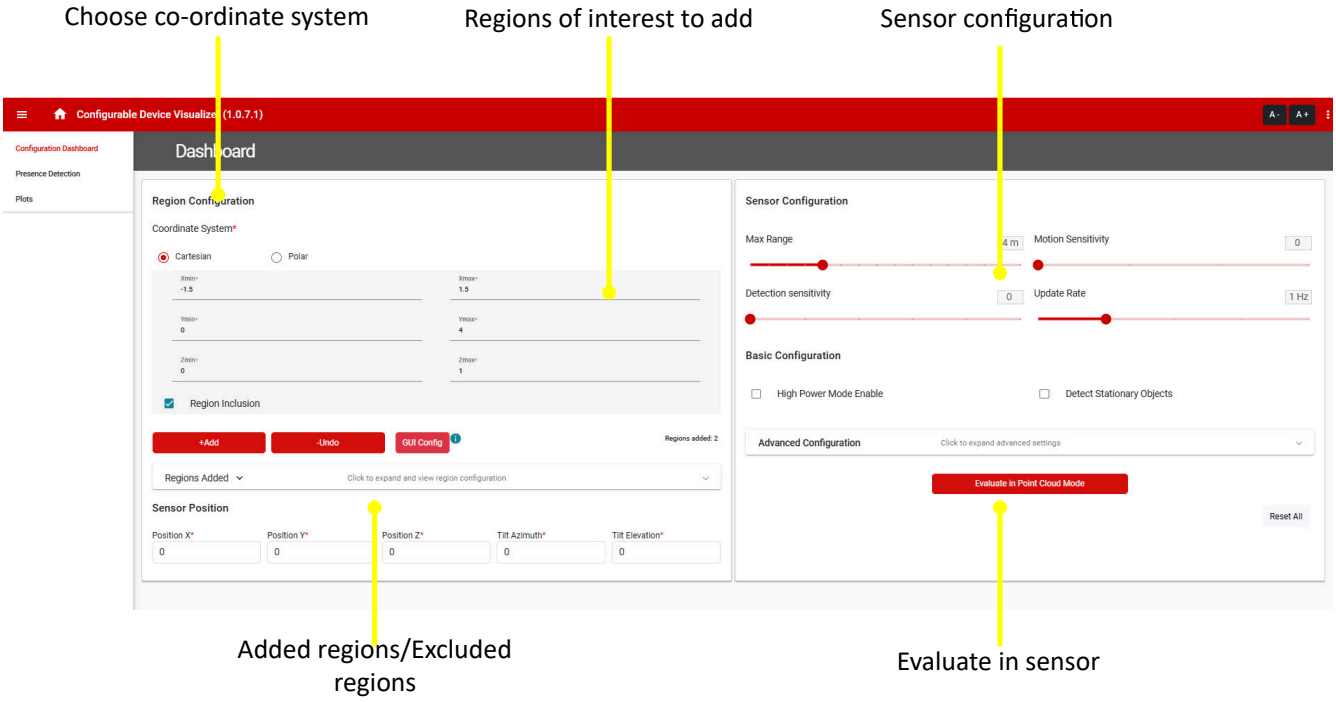


Figure 3-1. uDFP Visualizer UI

4 Implementation Results

4.1 Evaluation Setup

Ensure demo set up mentioned in Section 2.3.1.

4.2 Performance Data and Results

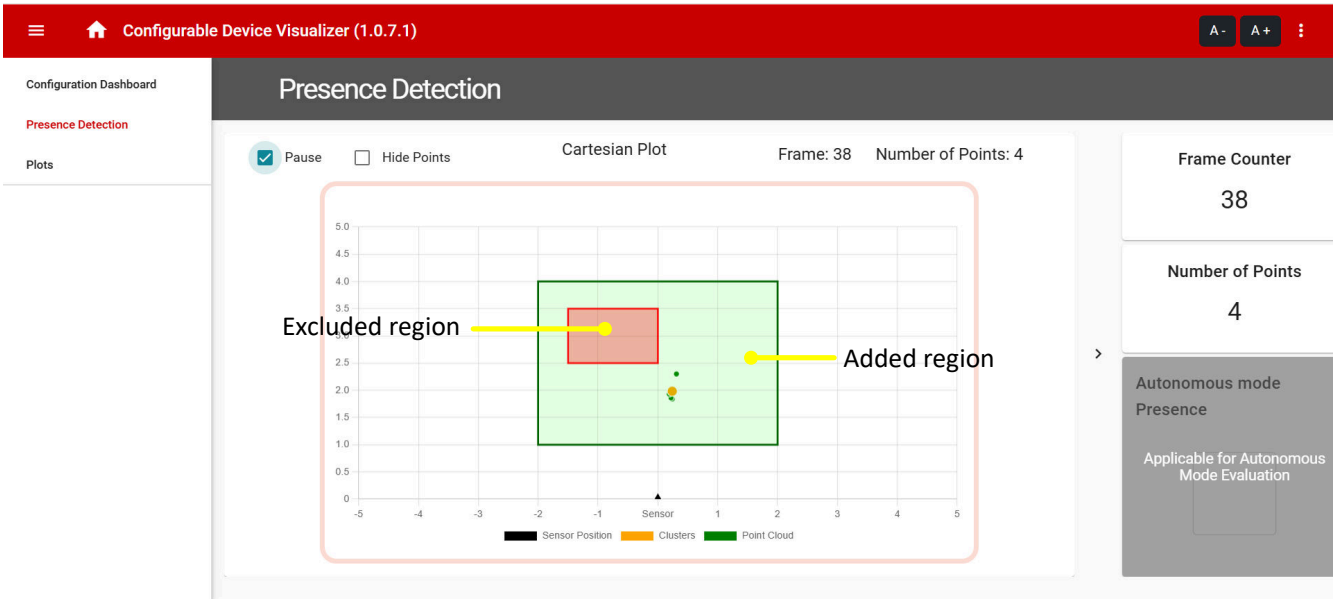


Figure 4-1. Cartesian plot from point cloud data in uDFP visualizer

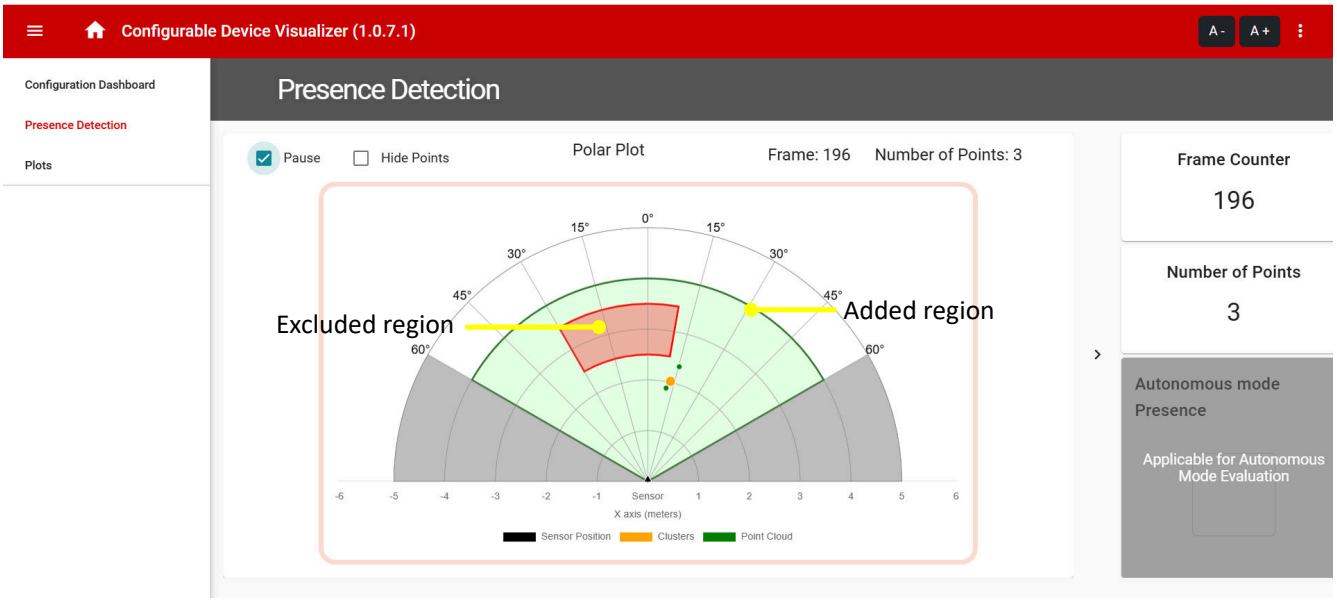


Figure 4-2. Polar plot from point cloud data in uDFP visualizer

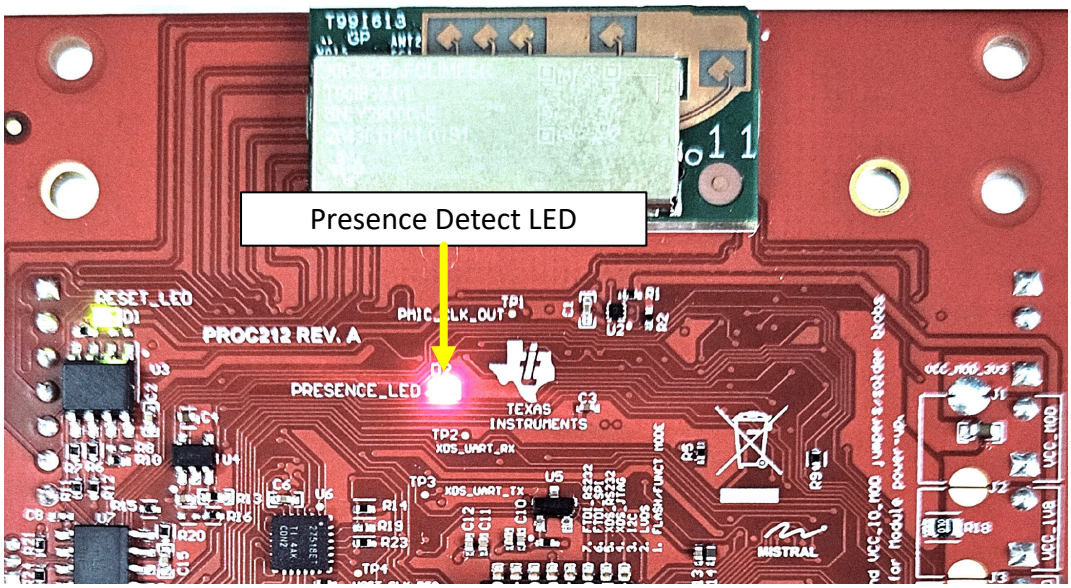


Figure 4-3. Presence detection LED on EVM blinking - Presence detected

5 Hardware Design Files

5.1 Schematics

Design Schematic

5.2 PCB Layouts

Design Layout

5.3 Bill of Materials (BOM)

Design Bill of Material (BOM)

6 Related Documentation

IWRL6432WMOD Data sheet - *IWRL6432WMOD*

IWRL6432W Data sheet - *IWRL6432W*

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