MT5B9SEN1K

TI IWR6843 mmWave Radar

Application Kit

User Guide

Revision 0.1

Prepared By	Reviewed By	Approved By

Index

1. INTRODUCTION

The MT5B9SEN1K is the sensor application kit which integrates Texas Instruments' industrial mmWave technology. This device targets low power and ultra-accurate mmWave systems in security, industrial, and personal health care applications.

The MT5B9SEN1K simplifies the implementation of mmWave sensors in the band of 60 to 64GHz, and it includes the ARM Cortex-R4F based processor system, 3Tx 4Rx antenna with specific SDK (Software Development Kit) for diverse applications, such as environment monitor, equipment inspection and maintain, personal health care, and objects' detection.

1.1. General Features

- Built-in Antenna
- Field of View of Radar: Azimuth: 120° / Elevation: 30°
- XDS110 based JTAG emulation with a serial port for internal QSPI flash programming
- Back-channel UART through USB-to-PC for logging purposes
- Two LEDs for basic user interface
- Micro USB connector
- 5V Power Jack to the device
- Dimensions: 60.00 mm (L) x 53.01 mm (W) x 18.06 mm (H)

1.2. Kit Contents

- MT5B9SEN1K Device
- 5V 2A Power Adapter with a 2.1-mm barrel jack
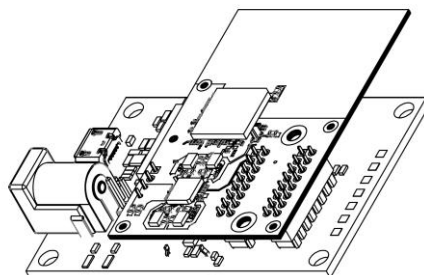
2. HARDWARE INFORMATION

2.1. Device View

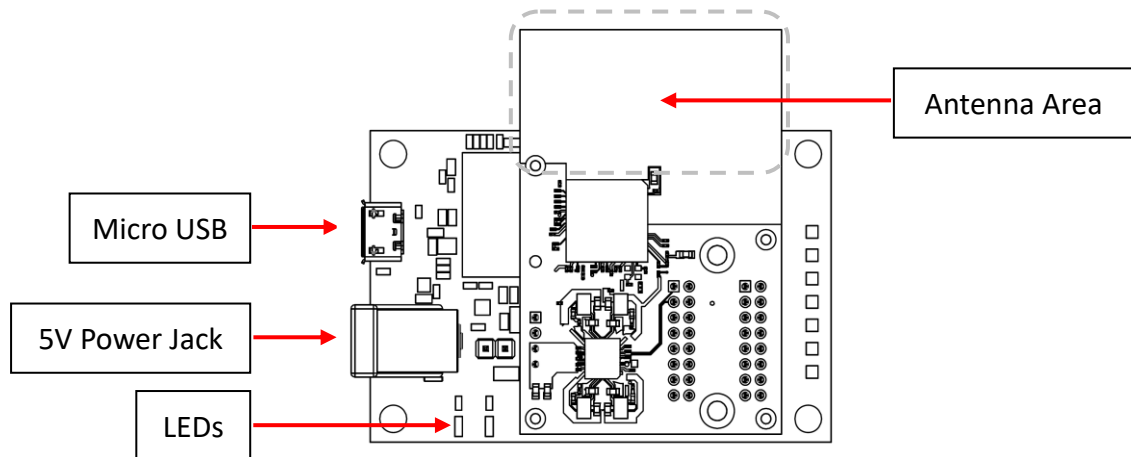Figure 2-1 to 2-2 shows the MT5B9SEN1K mmWave Radar Device.

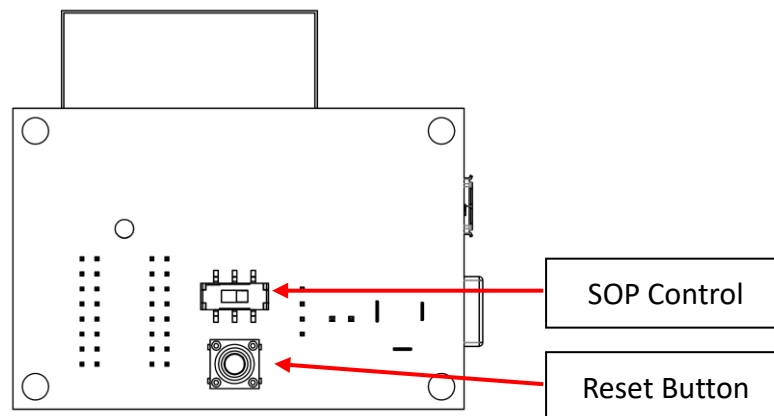

Figure 2-1. Device Front View

Figure 2-2. Device Back View

2.2. Power Connection

The mmWave device is powered by the 5-V power jack, shown in Figure 2-3. As soon as the power is provided, the Reset and Power LED should glow, indicating that the device is powered on.

Note: *After the 5V power supply is provided to the device, it is recommended to press the Reset button one time to ensure a reliable boot-up state.*
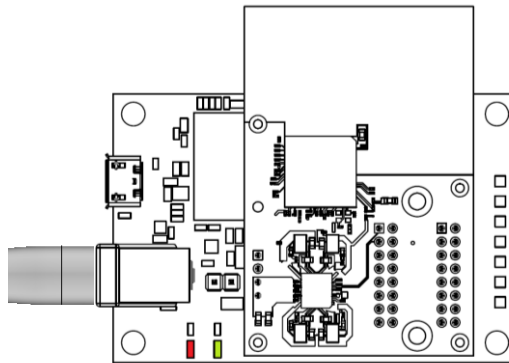

Figure 2-3. Power Connection

2.3. PC Connection

The connectivity is provided through the micro USB connector over the onboard XDS110 emulator. This connection provides the following interfaces to the PC:
- JTAG for Code Composer Studio™ (CCS) connectivity
- UART1 for flashing the onboard serial flash, downloading FW through Radar Studio, and getting application data sent through the UART
- MSS logger UART (can be used to get MSS code logs on the PC)

When the USB is connected to the PC, the device manager should recognize the following COM ports, shown in Figure 2-4:

XDS110 Class Application/User UART – UART1 port
XDS110 Class Auxiliary Data Port – MSS logger port

Figure 2-4. PC COM Ports

2.4. SOP mode by Slide Switch

The mmWave device can be set to operate in two different modes based on the state of the SOP slide switch. The state of the device is detailed by Table 2-1.

Table 2-1. SOP mode Switch List

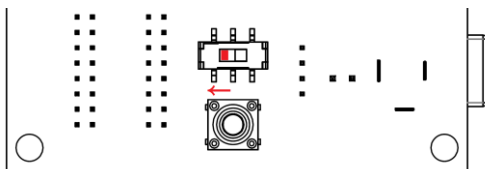| Reference	State	Comments
SOP mode-4	Normal mode	Slide switch move left
SOP mode-5	Flash programming	Slide switch move right

Figure 2-5 to 2-6 shows the SOP mode by slide switch.
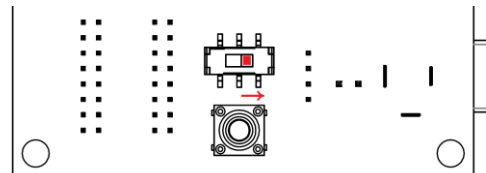

Figure 2-5. SOP mode-4   **Figure 2-6. SOP mode-5**

2.5. Reset Button and LEDs
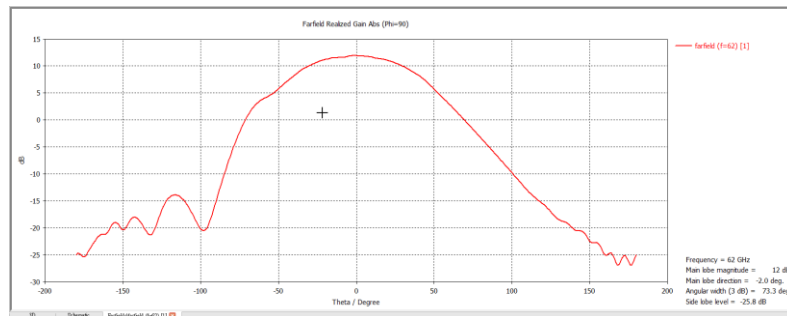
Table 2-2 provides the Reset and LEDs information.

Table 2-2. Reset and LEDs information

Reference	Usage	Comments
Reset button	RESET	Used to reset the mmWave device.
Red LED	5V supply indication	The LED indicates the presence of the 5V supply.
Green LED	nReset indication	The LED is used to indicate the state of nRESET pin. If the LED is glowing, the device is out of reset. The LED will glow only after the 5V supply is provided.

2.6. Antenna Performance

The peak gain of MT5B9SEN1K Antenna is > 10 dBi across the operating frequency band of 60 to 64 GHz. The peak output power with the antenna gain around 20 dBm EIRP. The radiation pattern of the antenna in the horizontal plane (H-plane , Phi = 0 degrees) and elevation plane (E-plane , Phi= 90 degrees) is shown in Figure 2-7.
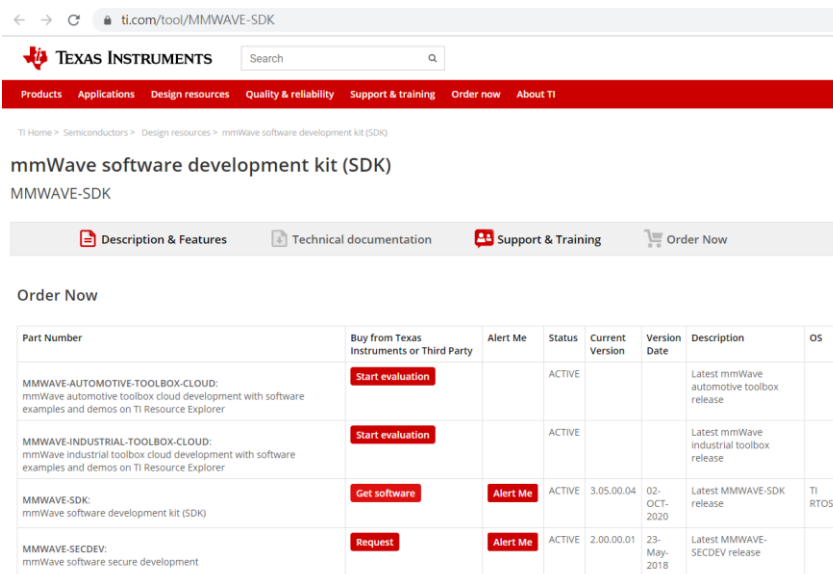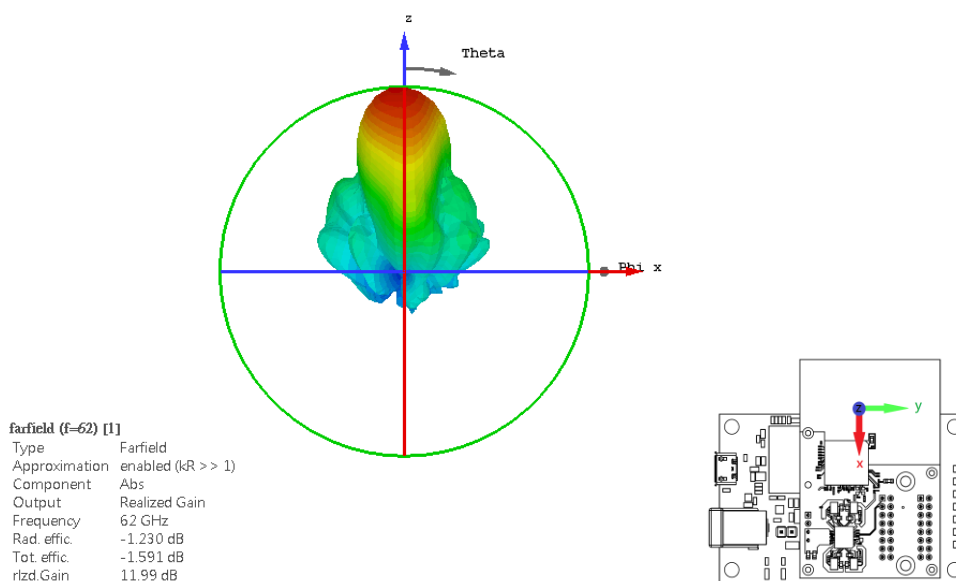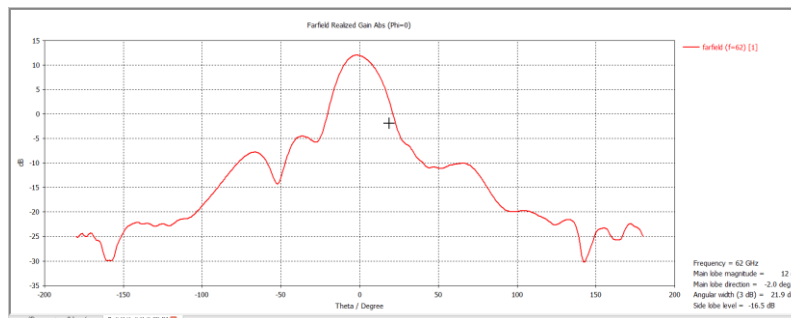
H-plane

E-plane

farfield (f=62) [1]

Type	Farfield
Approximation	enabled (kR >> 1)
Component	Abs
Output	Realized Gain
Frequency	62 GHz
Rad. effic.	-1.230 dB
Tot. effic.	-1.591 dB
rlzd.Gain	11.99 dB

Figure 2-7. Antenna Pattern

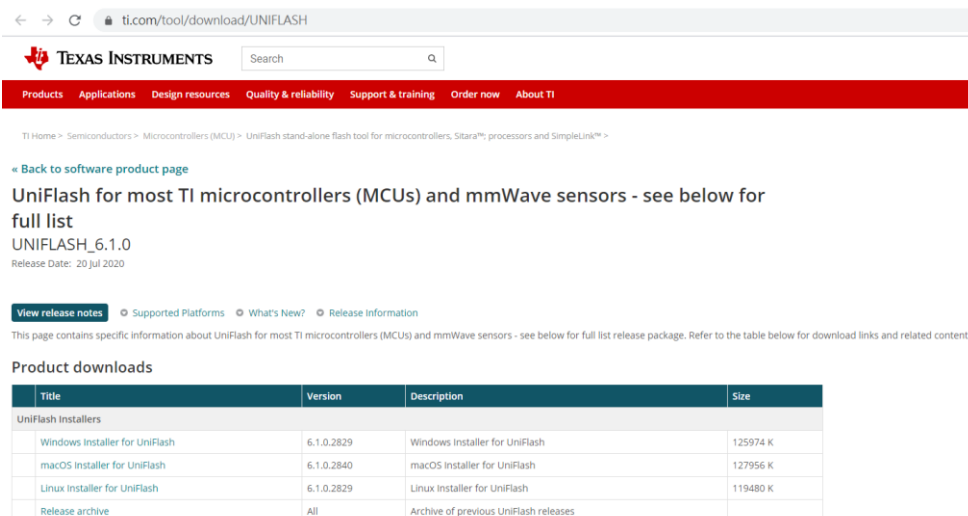## 3. SOFTWARE INFORMATION

3.1. Software Development Kit

The MT5B9SEN1K mmWave device design that based on TI IWR6843 ES2.0. The software development kit (SDK) includes demo codes、software drivers、emulation packages for debug and more that can be found at mmwave-sdk.

3.2. Programming Tool

The UniFlash Programmer for Texas Instruments devices that provides a single interface for programming Flash memory and executing Flash based operations on supported targets. Can be found at UniFlash.

3.3. Application Resource
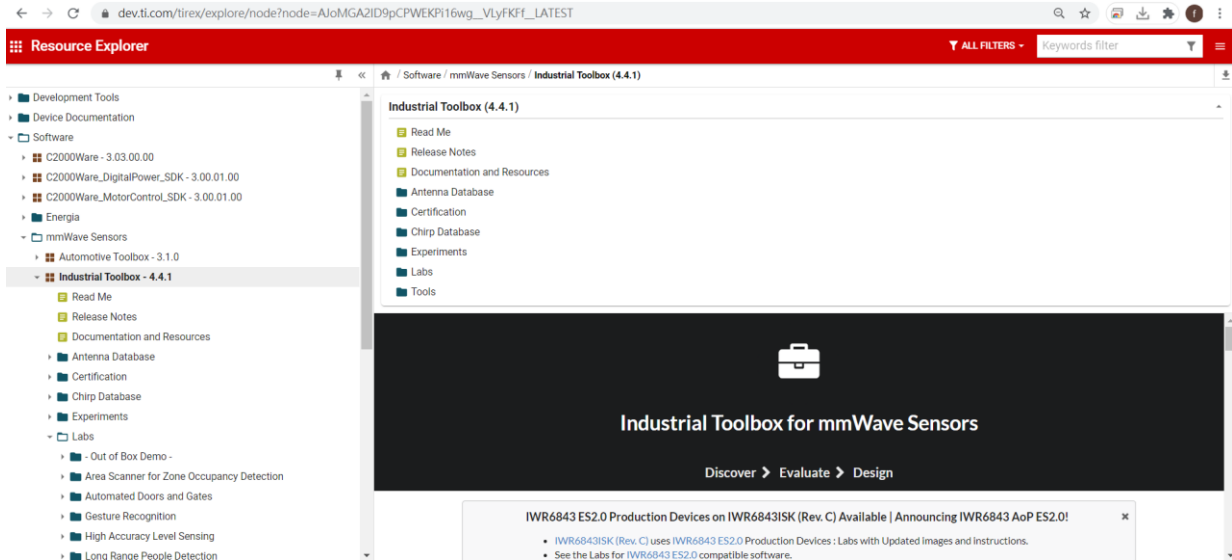
There are some application experiments at TI Resource Explorer include people counting、Gesture Recognition、traffic monitoring、vital signs and more that help to understand the design detail.

4. DEVICE DIMENSION
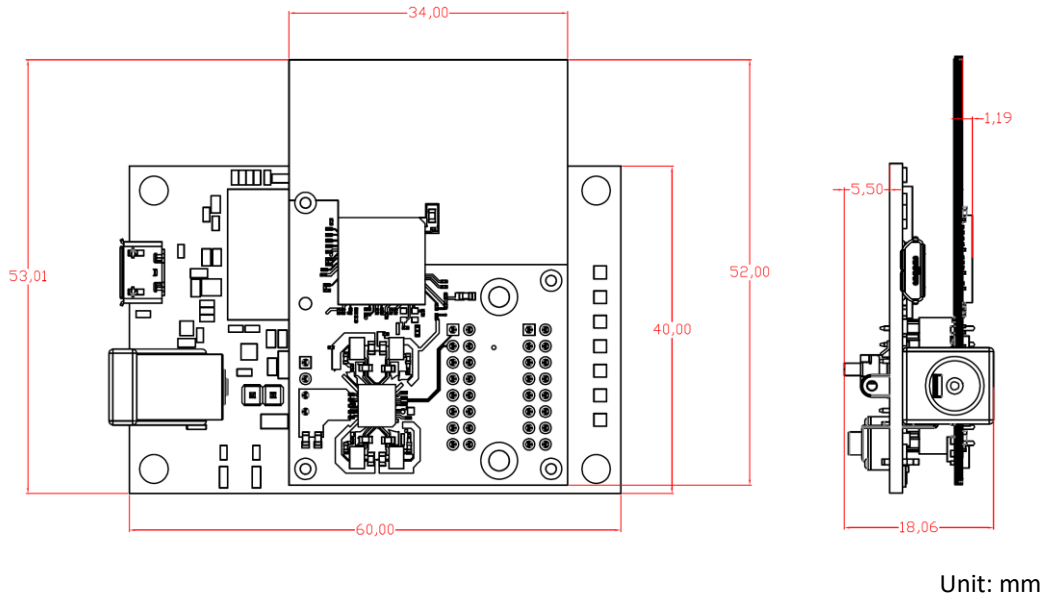
Figure 4-1 shows the device dimension.

Unit: mm

Figure 4-1. MT5B9SEN1K Device Drawing

5. ORDERING INFORMATION

Part number:	MT5B9SEN1K

6. HISTORY CHANGE

Revision	Date	Description
Revision 0.1	2020-10-12	Official Released.