Batman BM501 mmWave EVM Kit

mmWAVE SENSOR EVALUATION SOLUTION

Joybien Batman BM501 mmWave EVM Kit is a Texas Instruments (TI) IWR6843AOP ASIC based millimeter-wave (mmWave) Kit with Frequency-Modulated Continuous Wave (FMCW) radar technology capable of operation in the 60GHz to 64GHz band with up to 4 GHz continuous chirp, using 3 Transmission Antennas and 4 Receiving Antennas, for sensing target object's range, velocity, and angle parameters.

Batman BM501 mmWave EVM Kit consists of an extremely light and compact mmWave Module (with approx. 1/3 of the size of the previous Batman series mmWave Module; along with low-power, self-monitored, ultra-accurate, and lighting condition independent versatilities), a Module Carrier Board that brings user experience and hardware integration flexibilities, and a Pi-Hat-Board for simple and direct connectivity to a Raspberry Pi or NVIDIA Jetson Nano computer; suitable for various applications including: Education, Engineering, Science, Industrial, Medical, and Business & Consumer.

Applications

• Education's Practical Radar Introduction

• Engineering & Science's Motion Detection, Displacement, etc.

• Industrial sensor for Displacement & Safe Guard, Factory Automation, Robotics, etc.

• Building Automation sensor for Occupancy Detection, Proximity & Position sensing, People Counting, People Density, Security and Surveillance,

• Healthcare's Vital Signs Detection, People Fall Detection, etc.

• Business' Traffic Monitoring, and Proximity Advertisement

• Consumer's Gesture Recognition, Obstacle Avoidance, etc.

Features

• Operating Frequency: 60GHz ~ 64GHz coverage
with 4GHz continuous bandwidth

• Antenna: 3 Tx and 4 Rx Antenna on Package (AOP), with:

TX Power: 15 dBm

RX Noise Figure: 14 dB

• Processors: ARM R4F based MCU, and C674x DSP
for FMCW signal processing

• On-Chip Memory: 1.75MB

• Internal Memories With ECC

• Integrated Peripherals

• Extremely light and compact Module design.

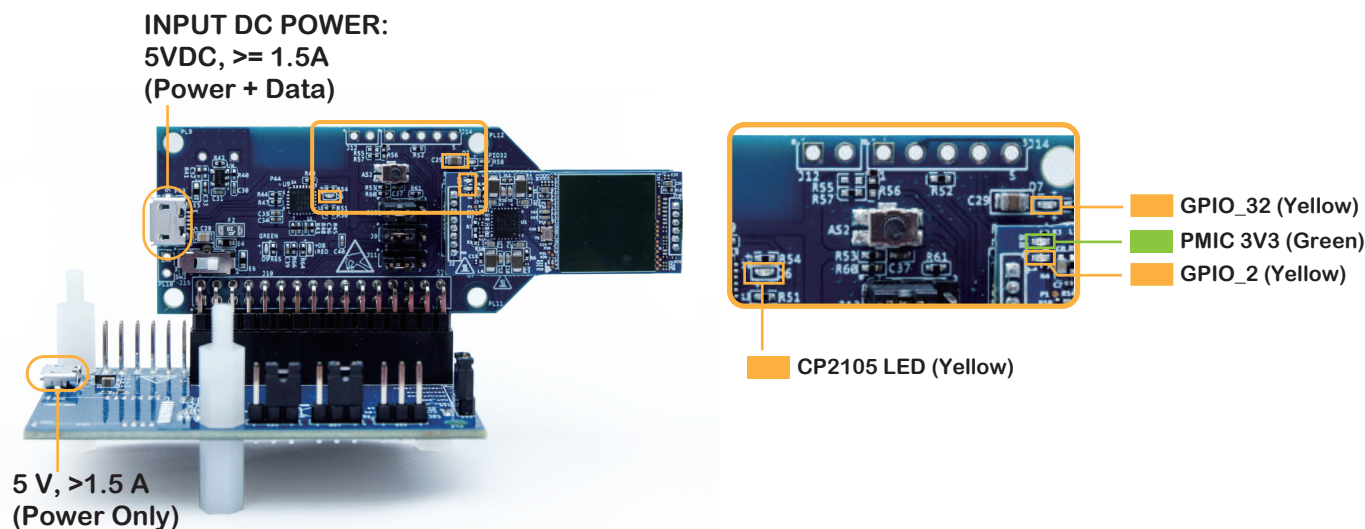• Supplied Voltage: 5VDC & 1.5A

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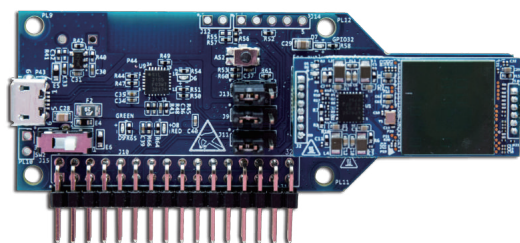
mmWAVE SENSOR EVALUATION SOLUTION

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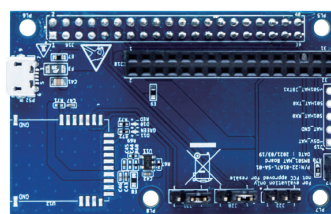## Packing List: mmWave Module, Raspberry Pi-Hat Board, Python SDK

● Make sure you are using the correct power supply of 5 V, >1.5 A with a Micro USB connection

INPUT DC POWER:
5VDC, >= 1.5A
(Power + Data)

5 V, >1.5 A
(Power Only)

GPIO_32 (Yellow)
PMIC 3V3 (Green)
GPIO_2 (Yellow)

CP2105 LED (Yellow)

Batman BM501 EVM Kit includes

mmWave

+

Raspberry Pi / Jetson Nano
Hat Board

+

Python SDK
(Python SDK upon request)

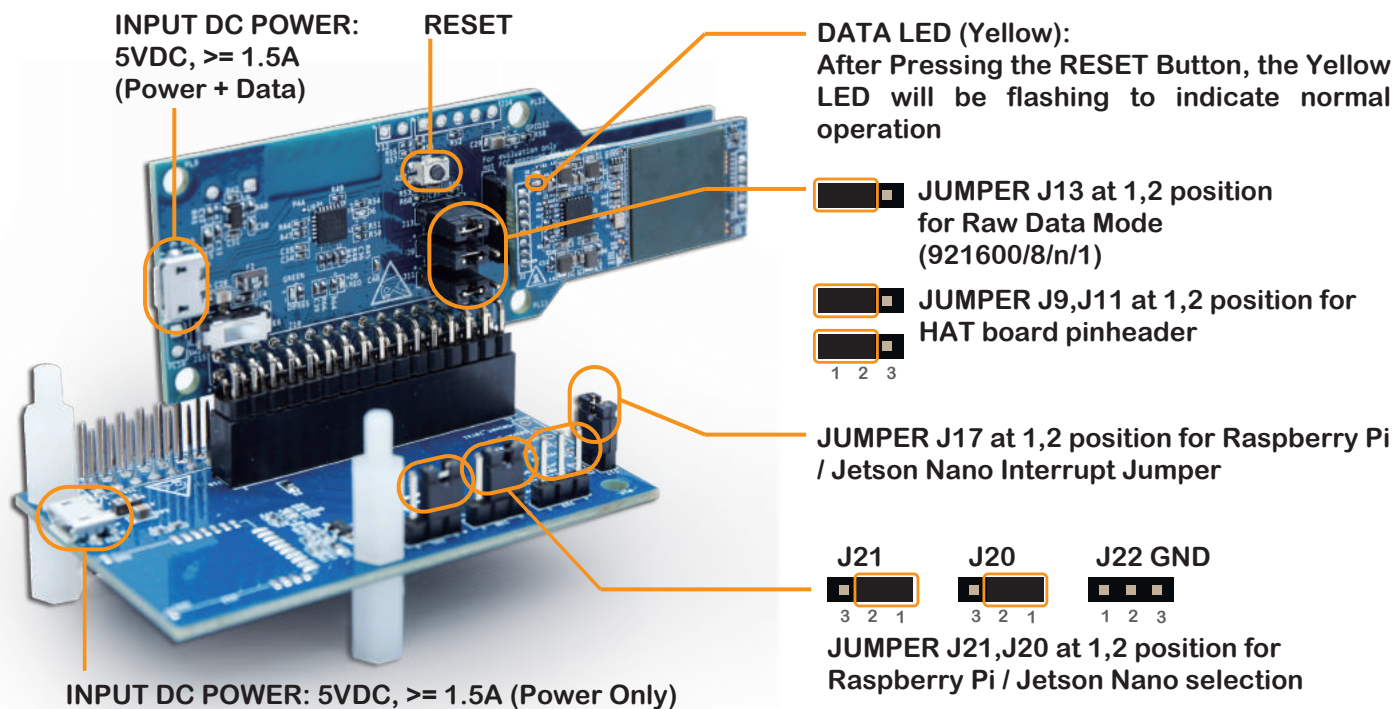## Python SDK

Python SDK upon purchasing BM501 EVM Kit via email

https://github.com/bigheadG/mmWave
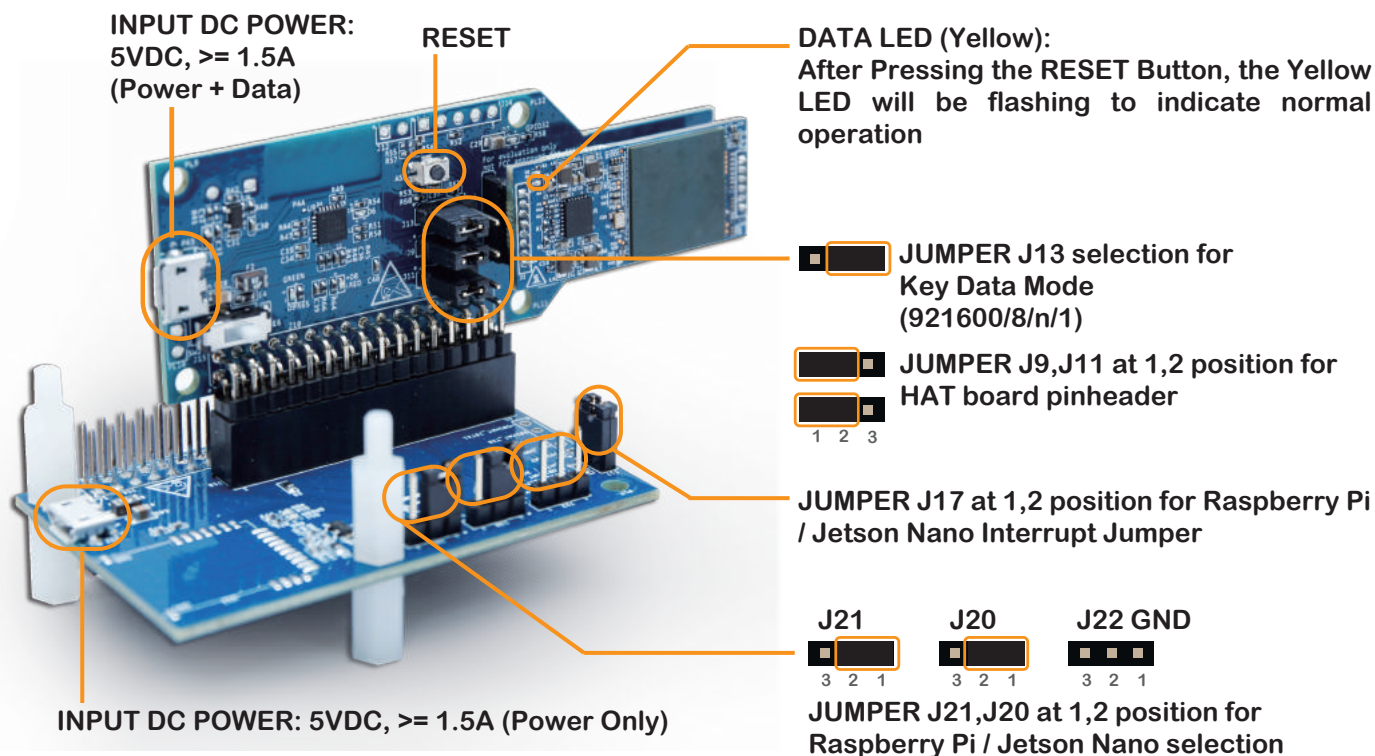
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mmWAVE SENSOR EVALUATION SOLUTION

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Selection：Key Data Mode or Raw Data Mode Application

(A) Raw Data Mode(921600/8/n/1)

INPUT DC POWER:
5VDC, >= 1.5A
(Power + Data)

RESET

DATA LED (Yellow):
After Pressing the RESET Button, the Yellow LED will be flashing to indicate normal operation

JUMPER J13 at 1,2 position for Raw Data Mode (921600/8/n/1)

JUMPER J9,J11 at 1,2 position for HAT board pinheader

1 2 3

JUMPER J17 at 1,2 position for Raspberry Pi / Jetson Nano Interrupt Jumper

J21   J20   J22 GND

3 2 1   3 2 1   1 2 3

JUMPER J21,J20 at 1,2 position for Raspberry Pi / Jetson Nano selection

INPUT DC POWER: 5VDC, >= 1.5A (Power Only)

(B) Key Data Mode(921600/8/n/1)

INPUT DC POWER:
5VDC, >= 1.5A
(Power + Data)

RESET

DATA LED (Yellow):
After Pressing the RESET Button, the Yellow LED will be flashing to indicate normal operation

JUMPER J13 selection for Key Data Mode (921600/8/n/1)

JUMPER J9,J11 at 1,2 position for HAT board pinheader

1 2 3

JUMPER J17 at 1,2 position for Raspberry Pi / Jetson Nano Interrupt Jumper

J21   J20   J22 GND

3 2 1   3 2 1   3 2 1

JUMPER J21,J20 at 1,2 position for Raspberry Pi / Jetson Nano selection
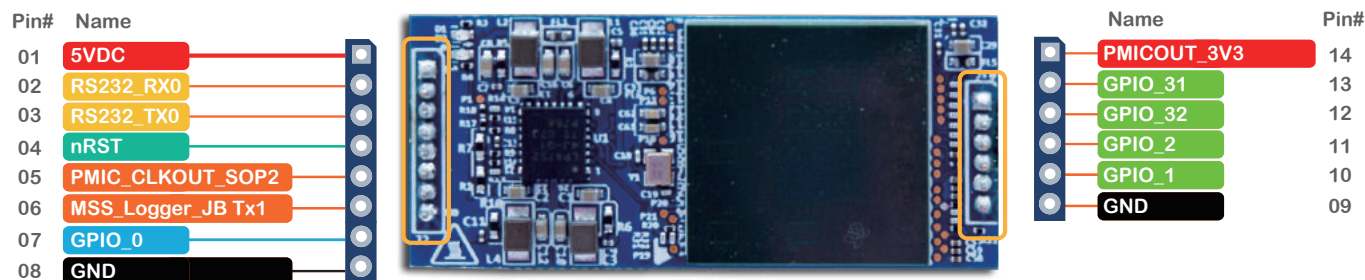
INPUT DC POWER: 5VDC, >= 1.5A (Power Only)

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mmWAVE SENSOR EVALUATION SOLUTION

mmWAVE SENSOR EVALUATION SOLUTION

Batman BM501 Module Pin Assignment Note

Pin#	Name
01	5VDC
02	RS232_RX0
03	RS232_TX0
04	nRST
05	PMIC_CLKOUT_SOP2
06	MSS_Logger_JB Tx1
07	GPIO_0
08	GND

Name	Pin#
PMICOUT_3V3	14
GPIO_31	13
GPIO_32	12
GPIO_2	11
GPIO_1	10
GND	09

Batman BM501 Carry Board J10 Pin Assignment Note

PINHEADER J10 PIN12_GPIO_0 High: Raw Data Baud Rate 921600/8/n/1 selection for PIN23_TX1
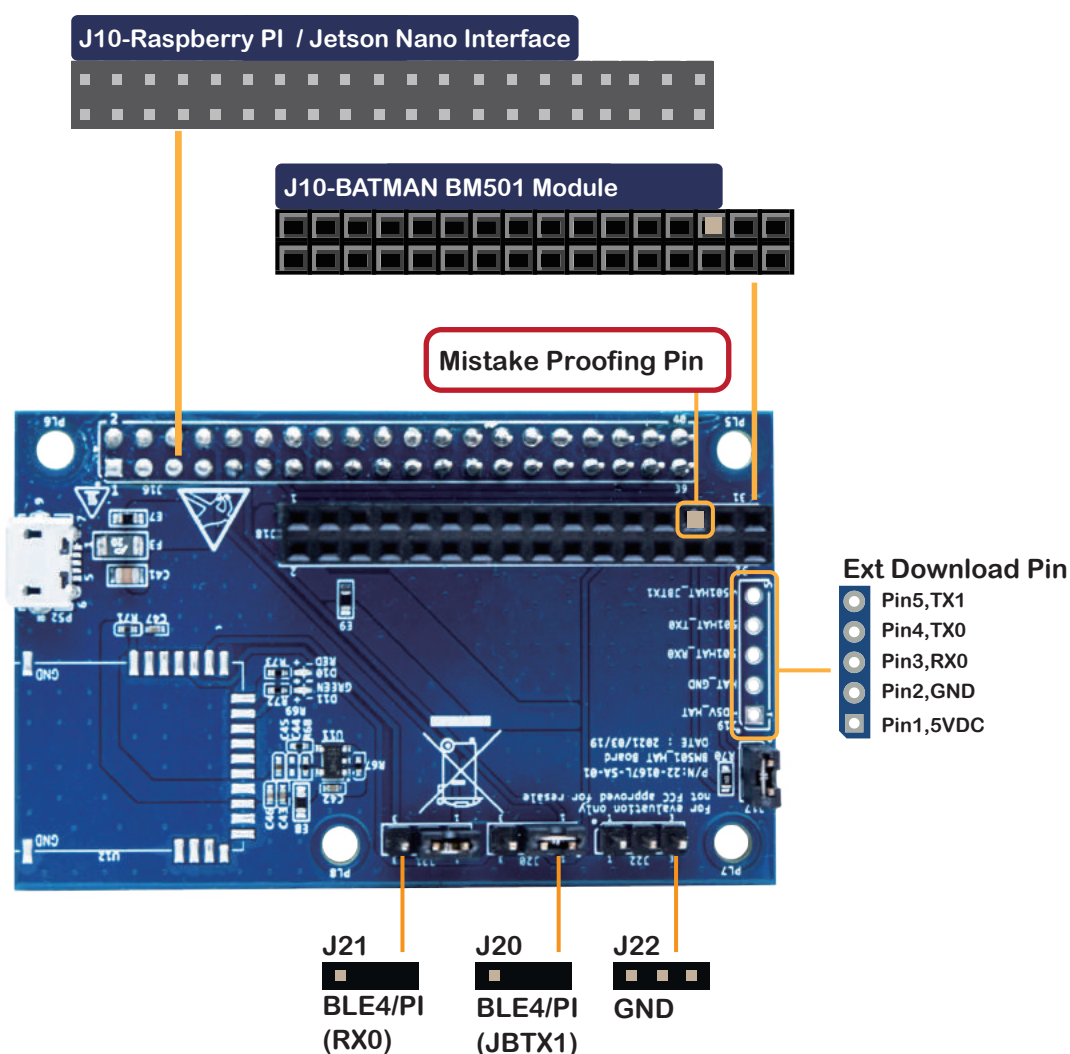PINHEADER J10 PIN12_GPIO_0 Low : Key Data Baud Rate 921600/8/n/1 selection for PIN23_TX1

PINHEADER J10 PIN5_GND: Ground Pin

PINHEADER J10 PIN5V: 5VDC, 1.5A

PINHEADER J10 PIN23_TX1:
The UART TX1 Voltage Level is 3.3VDC (NOT 5VDC). Please handle with care

Mistake Proofing Pin

This is NOT a broken pin. It is a "Mistake Proofing Pin", purposely cut-off; so to avoid a user to install the Module on top of the HAT-Board backward (also see the corresponding pin-hole location on the Female Connector on the HAT-Board with the pin-hole blocked).

Alert : All GPIO Pins base on 5V System. Pin23_TX1 is DC 5V system.

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mmWave Raspberry Pi Hat Pin Assignment

**J10-Raspberry PI / Jetson Nano Interface**

J10-BATMAN BM501 Module

Mistake Proofing Pin

Ext Download Pin
- Pin5,TX1
- Pin4,TX0
- Pin3,RX0
- Pin2,GND
- Pin1,5VDC

J21

BLE4/PI
(RX0)

J20

BLE4/PI
(JBTX1)

J22

GND

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Batman Kit + NVIDIA Jetson Nano / Batman Kit + Raspberry Pi

Please make sure that the JUMPER SETTING is for Raw Data Mode

Batman BM501 EVM Kit + Jetson Nano
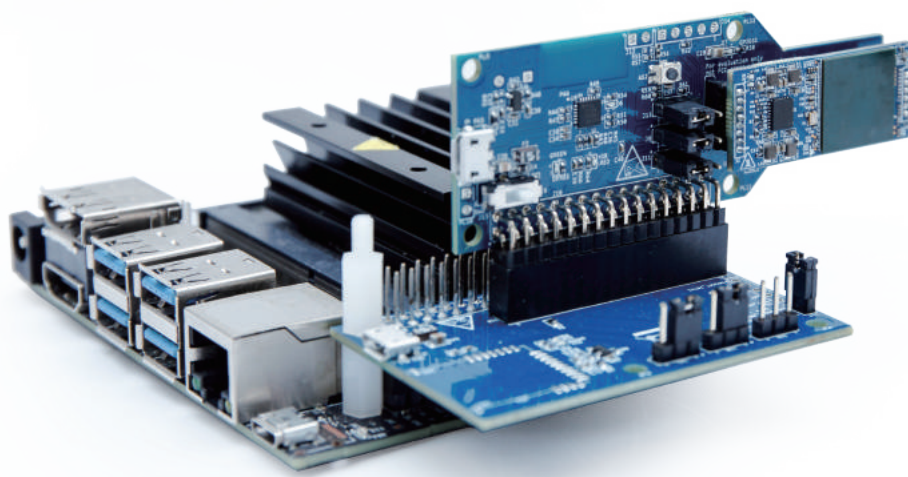
Batman BM501 EVM Kit + Raspberry Pi
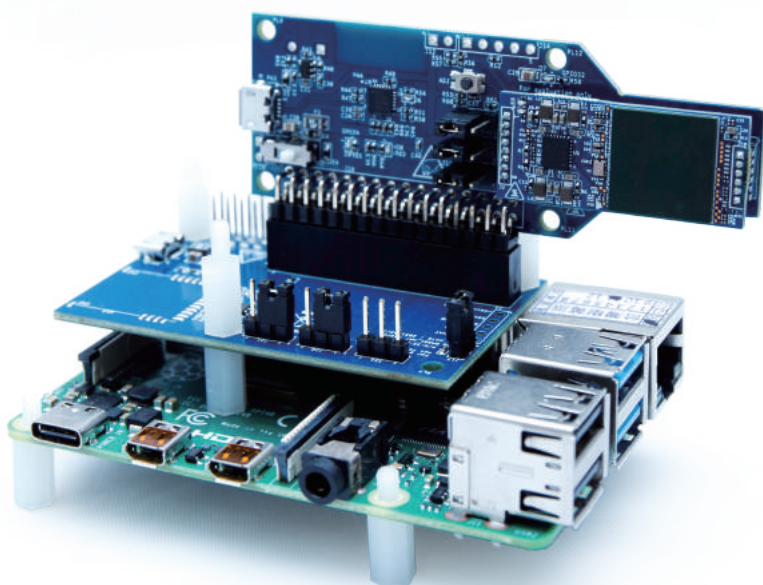
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mmWAVE SENSOR EVALUATION SOLUTION

Specifications

mmWave Sensor Evaluation Module

mmWave ASIC	TI IWR6843AOP Single Chip mmWave Sensor
FMCW Transceiver	● Integrated PLL, Transmitter, Receiver, Baseband, and A2D ● 60GHz to 64GHz Coverage With 4GHz Continuous Bandwidth ● Four Receive Channels ● Three Transmit Channels ● Ultra-Accurate Chirp Engine Based on Fractional-N PLL ● TX Power: 15 dBm ● RX Noise Figure: 14 dB ● Phase Noise at 1 MHz: –92 dBc/Hz ● Antenna Type : Antenna On Package(AOP)
Built-in Calibration and Self-Test (Monitoring)	● ARM® Cortex® -R4F-Based Radio Control System ● Built-in Firmware (ROM) ● Self-calibrating System Across Frequency and Temperature
DSP	● C674x DSP for Advanced Signal Processing
On-Chip Memory	● 1.75MB
MCU	● ARM R4F Microcontroller for Object Detection, and Interface Control ● Joybien mmWave Protocol (Per configuration)
I/O	● UART x 2 ● GPIO x 2
Power Management	● Built-in LDO Network for Enhanced PSRR ● I/Os Support Dual Voltage 3.3 V
Clock Source	40MHz
Antenna Orientation	4 receive(RX) 3 transmit (TX) antenna with 120° azimuth field of view (FoV) and 120° elevation FoV
Input Power	5VDC, 1.5A source
Operating Temperature & Humidity	0°C ~ 40°C 10% ~ 85% Non-Condensing
Dimensions & Weight	37mm x 16mm x 3.2mm ; 3 grams net

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Raspberry Pi / Jetson Nano
Hat Board

| Connector	• Matching mmWave Module Female Connector • Matching Raspberry Pi GPIO Female Connector • Micro USB Power Connector (Power only) • Jumpers for Bluetooth Tx/Rx or Raspberry Pi Tx/Rx Selection
Bluetooth (optional)	• Joybien JBT24M Bluetooth Low Energy Module
Micro USB Input Power	• 5VDC, 1.5Amp. (Note: Power Adapter and Micro USB Cable NOT included)
Operating Temperature Operating Humidity	• 0° to 40° degree Celsius • 10 ~ 85% Non-Condensing
Dimensions & Weight	• 60mm x 39mm 21 grams

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mmWAVE SENSOR EVALUATION SOLUTION

mmWAVE SENSOR EVALUATION SOLUTION

mmWave Pin Assignment

J3   J3 Pin Assignment

Pin#	Name		Name	Pin#
01	5VDC		5VDC	02
03	5VDC		X	04
05	GND		X	06
07	RS232 RX		X	08
09	RS232 TX		GND	10
11	nRST		GPIO 0	12
13	GND		X	14
15	GPIO31		X	16
17	GPIO32		X	18
19	GND		X	20
21	X		X	22
23	MSS LOGGER JBTX1		X	24
25	X		GND	26
27	Mistake Proofing Pin		X	28
29	GND		X	30
31	X		GPIO 32	32
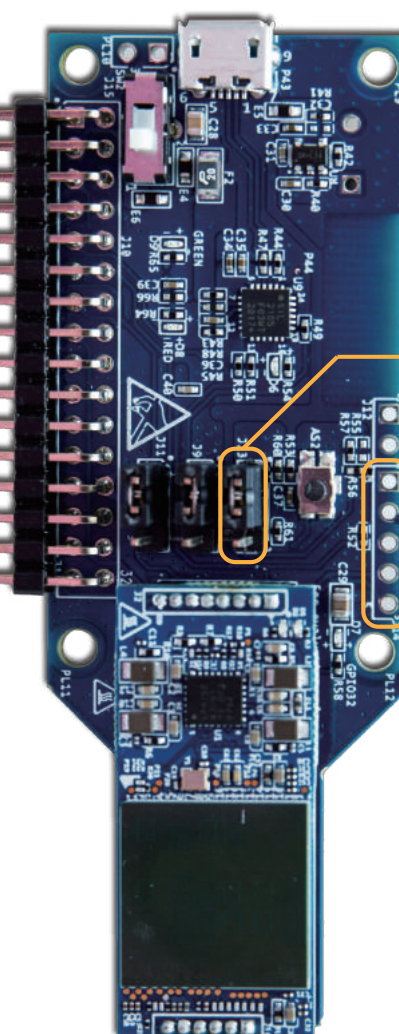
J13   J13 Pin Assignment

13   RAWdata / Keydata

	Name	Pin#
	DC 5V	01
	GND	02
	RX0	03
	TX0	04
	TX1	05

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mmWAVE SENSOR EVALUATION SOLUTION

J10 Pin Assignment

Pin No	Name	Pin Type	Function Description
01	5VDC	I	POWER 5VDC Input
02	5VDC	I	POWER 5VDC Input
03	5VDC	I	POWER 5VDC Input
04	X	X	X
05	GND	GROUND	Digital ground
06	X	X	X
07	RS232 RX0	I	UART A Receive
08	X	X	X
09	RS232 TX0	O	UART A Transmit
10	GND	GROUND	Digital ground
11	nRST	I	Power on reset for chip. Active low
12	GPIO 0	I	Select KeyData or RawData
13	GND	GROUND	Digital ground
14	X	X	X
15	GPIO 31	IO	GPIO Pin
16	X	X	X
17	GPIO 32	IO	GPIO Pin
18	X	X	X
19	GND	GROUND	Digital ground
20	X	X	X
21	X	X	X
22	X	X	X
23	MSS LOGGER JBTX1	O	UART B Transmit
24	X	X	X
25	X	X	X
26	GND	GROUND	Digital ground
27	X	X	Mistake Proofing Pin
28	X	X	X
29	GND	GROUND	Digital ground
30	X	X	X
31	X	X	X
32	GPIO2	O	LED Indicator

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Product Dimensions

37mm

16 mm

module

82.5mm

30 mm

module + Carrier Board
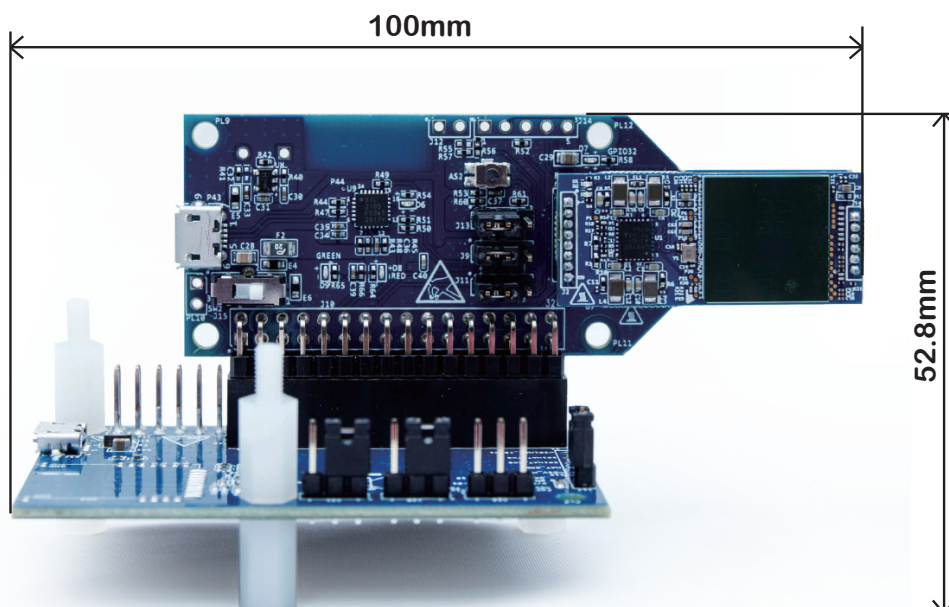
65.2mm

40.8mm

Hat board
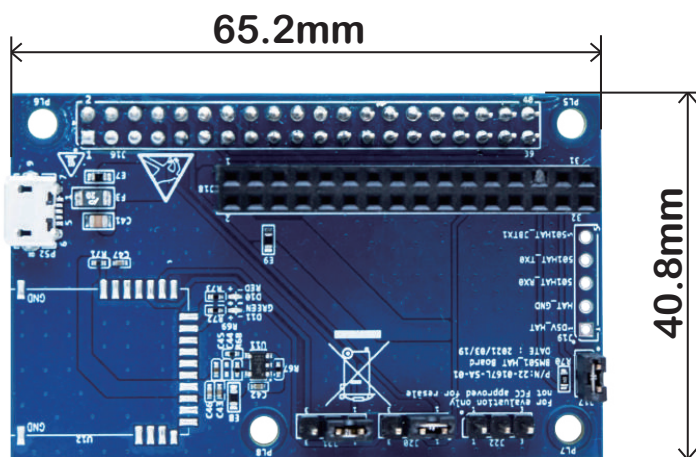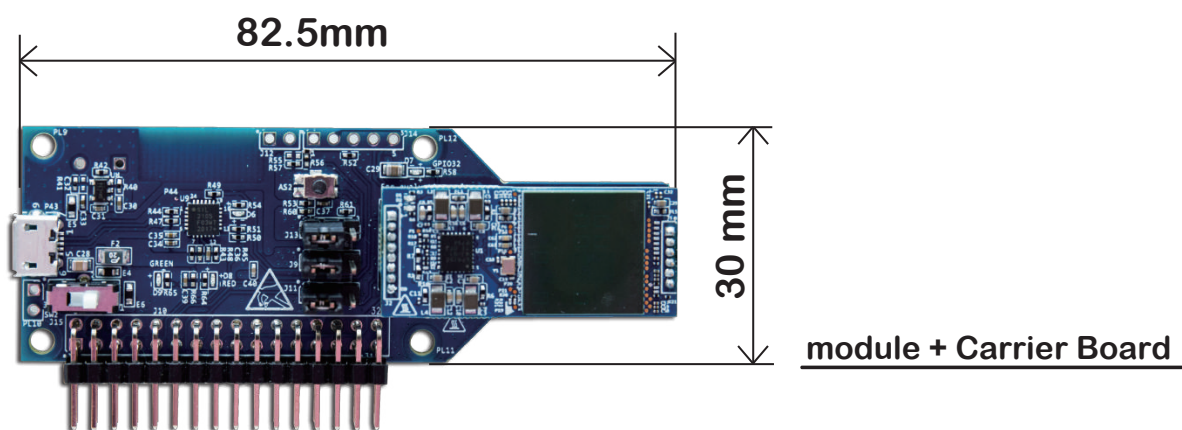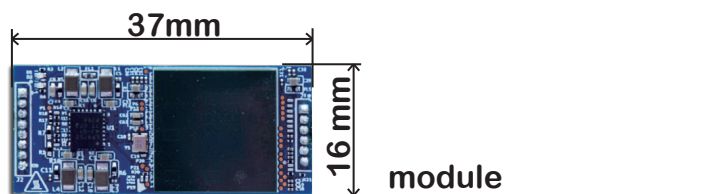
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Product Dimensions

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"Python" is a registered trademark of the PSF.
This EVM Kit does not include Raspberry Pi computer, nor NVIDIA Jetson Nano computer.