

MT5C01-00

60GHz mmWave Radar Sensor

April 2023



- 01** Jorjin Company Overview
- 02** Jorjin mmWave Radar Portfolio
- 03** Features & Specification
- 04** Industrial Use Cases

1997

- **Founded**
- **started with component**



2007



WIRELESS CONNECTIVITY MODULES

2018 – 2020

- **J-Reality Was Nominated for MWC's Best Connected Consumer Electronic Device**
- **J7EF Plus Enhanced gesture interactions**



AR/MR Glasses

2013 - 2017

- **Smart Glasses ODM Reference design**



2022/JAN

**J7EF Gaze
Powerful Eye Tracking
Solution**



Our Values for mmWave radar sensor

R&D –

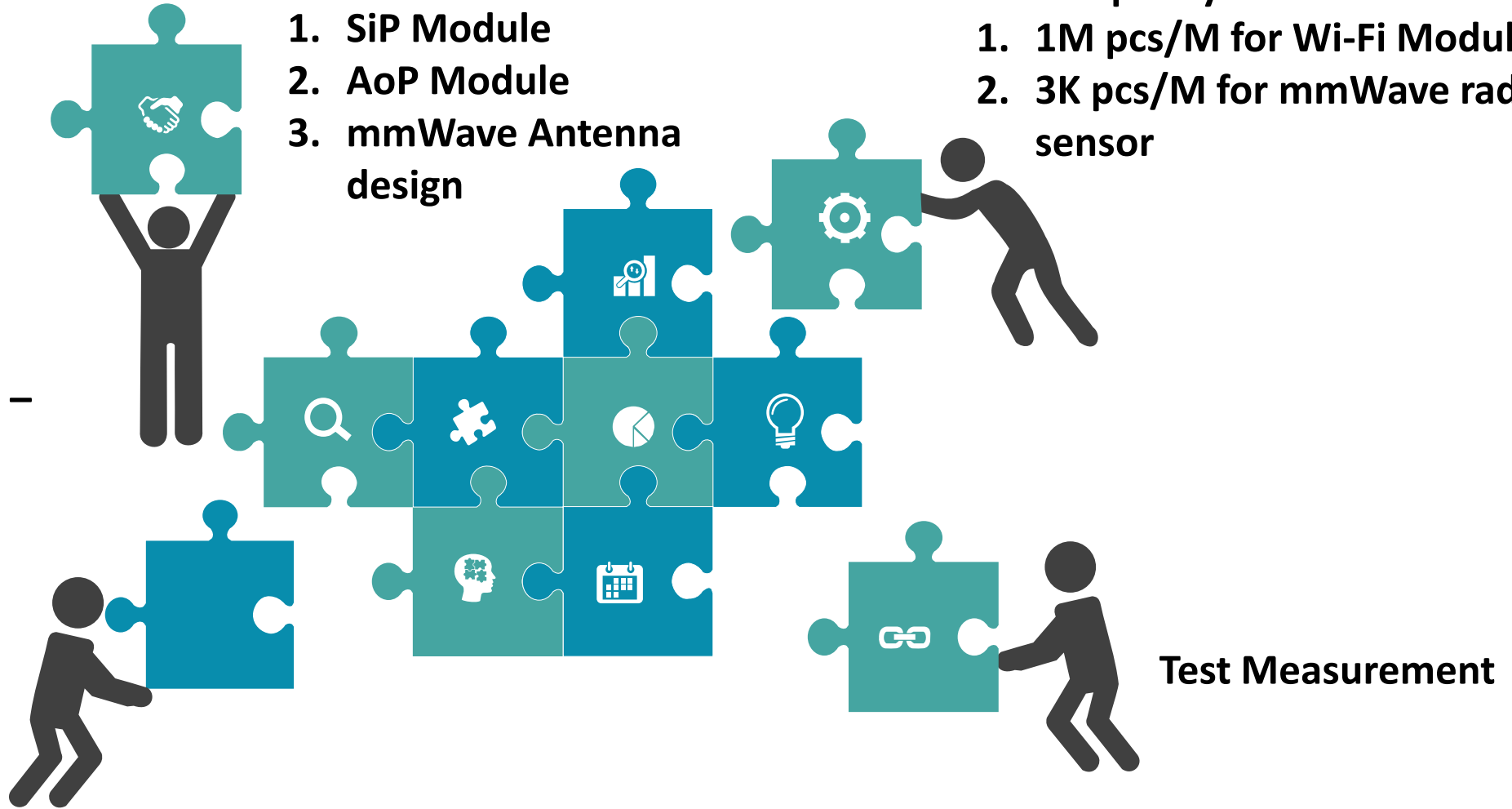
1. SiP Module
2. AoP Module
3. mmWave Antenna design

MFG capacity –

1. 1M pcs/M for Wi-Fi Module
2. 3K pcs/M for mmWave radar sensor

Substrate Partner –

1. Kyocera
2. Plotech
3. Unimicron
4. WUS



Test Measurement

mmWave Radar Portfolio (2023~2025)

2023

2024

2025

mmWave radar EVM: MT5C01-00

- ◆ 60GHz, TI IWRL6432
- ◆ Package: PCBA + Detached Module
- ◆ Sample Q2 2023
- ◆ RTM Q1 2024

mmWave radar module + 2.4GHz WLAN SISO (Wi-Fi 6 TRX) + ST MCU

- ◆ 60GHz, TI IWRL6432 + CC3300 + STM32
- ◆ Sample Q4 2023
- ◆ RTM Q2 2024

mmWave radar module + 2.4/5/6GHz WLAN SISO (Wi-Fi 6/6E TRX) + ST MCU

- ◆ 60GHz, TI IWRL6432 + CC3360 + STM32
- ◆ Sample Q4 2024
- ◆ RTM Q2 2025

mmWave radar module + 2.4GHz WLAN SISO (MCU-based Wi-Fi 6)

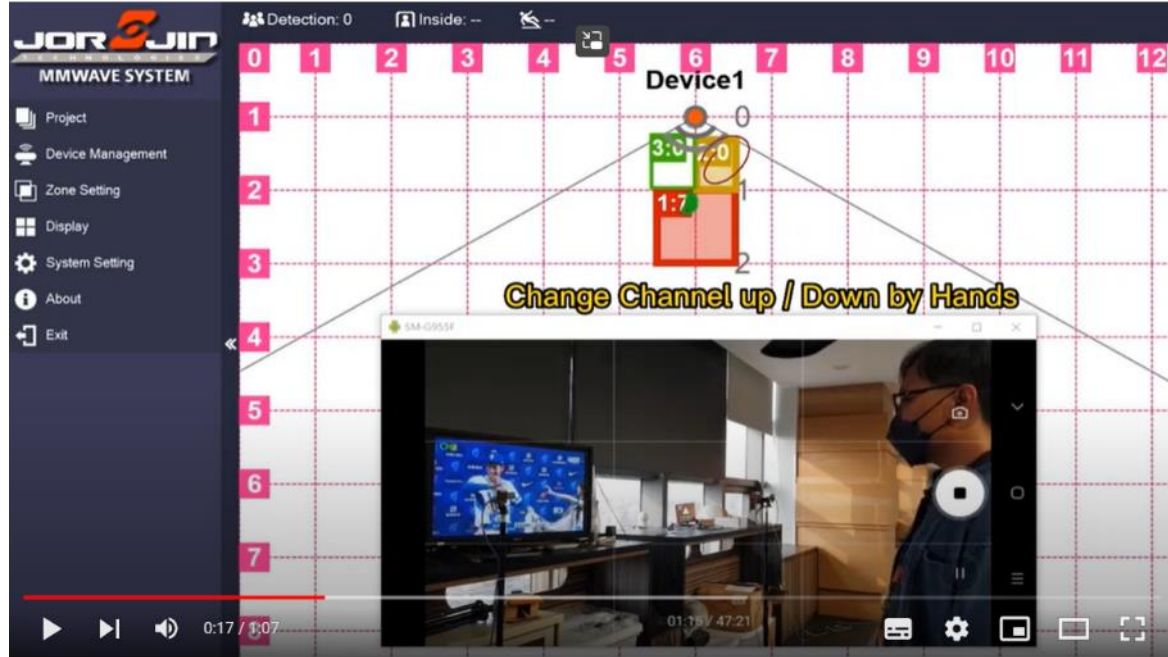
- ◆ 60GHz, TI IWRL6432 + CC350X
- ◆ Sample Q3 2024
- ◆ RTM Q2 2025

mmWave radar module + 2.4/5/6GHz WLAN SISO (MCU-based Wi-Fi 6/6E)

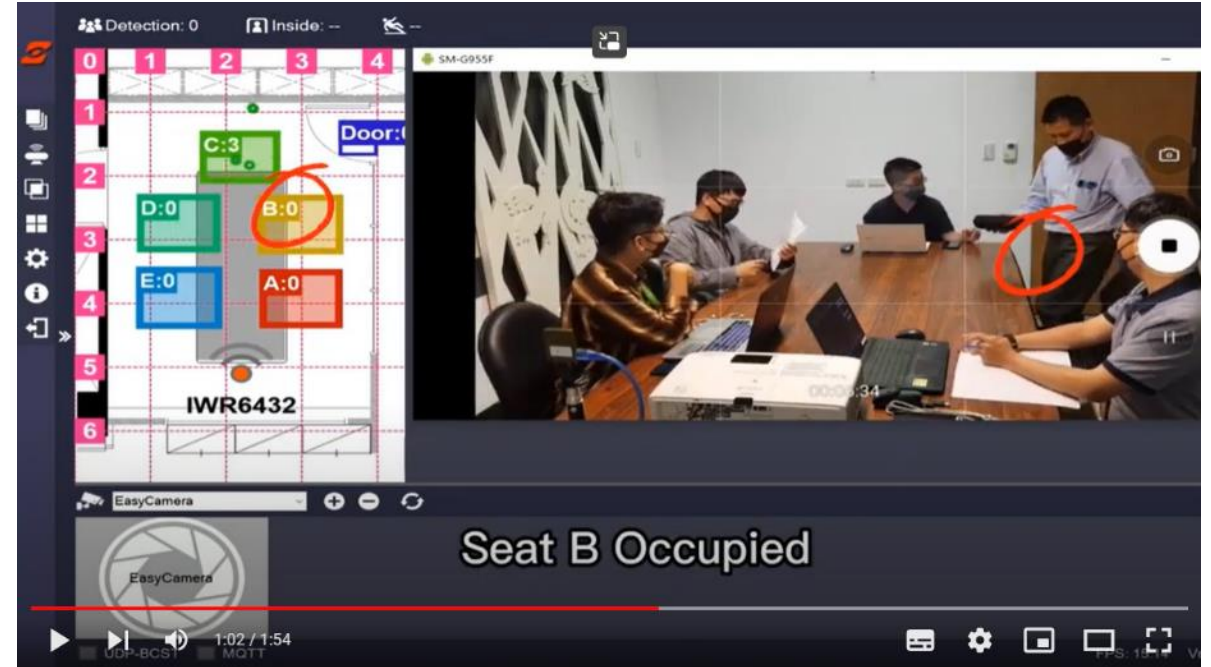
- ◆ 60GHz, TI IWRL6432 + CC356X
- ◆ Sample Q4 2024
- ◆ RTM Q4 2025



Presence / Motion Detect



TV



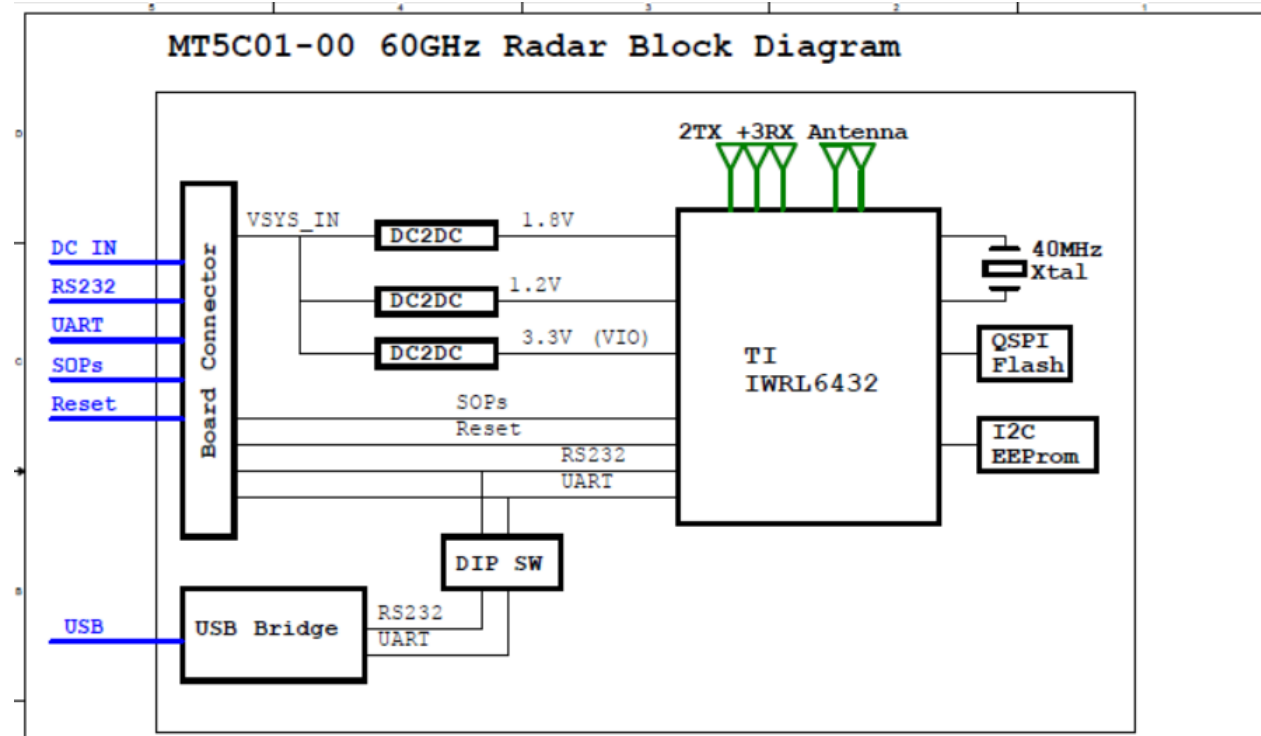
Meeting Room



Jorjin Model	MT5B9S-01	MT5C01-00
Coverage	60-64 GHz	60-64 GHz
Core Chip	TI, IWR6843	TI, IWRL6432
Dimensions (WxHxD)mm	78mm x 64mm x 23.5mm	31.5mm x 24mm x 4mm (w/o enclosures)
Radio Control System	ARM Cortex-R4F	ARM Cortex-M4F
Signal Processing	FMCW at C674x DSP	-
On chip memory	1.75 MB	1.0MB
Power Consumption	1.75W (People Counting)	2mW (Presence Detect)
Antenna (Transmit / Receive Channels)	3Tx / 4Rx	2Tx / 3Rx
Data Transfer (Micro USB connector / Wi-Fi (customized))	UART	UART

Features & Block Diagram

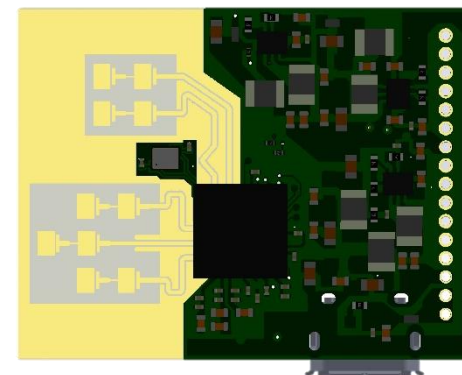
- Built-in 3RX and 2TX Antenna
- Integrated frequency synthesizer: 60~64 GHz
- ARM Cortex M4F MCU @160 MHz
- Average power consumption of <2mW to 25mW+ (depending on duty cycle)
- Interface: UART、RS232、SPI、CAN、I2C
- 5V/1A Power input
- 1.27 mm pin header
- Internal USB to UART bridge for demonstration
- Small Form Factor Module, Low Power and High Performance
- Temperature range: -40~85° C
- Dimensions: 31.5 mm (L) x 24 mm (W) x 2.2 mm (H)



Jorjin Antenna Spec.

Azimuth FOV	120°
Elevation FOV	100°
Azimuth Angle Resolution	≤30°
Gain	6dBi
Bandwidth	7GHz
Frequency	57-64GHz (target)

Top View



Pin-16
Pin-15
Pin-14
Pin-13
Pin-12
Pin-10
Pin-9
Pin-8
Pin-7
Pin-6
Pin-5
Pin-4
Pin-3
Pin-2
Pin-1

Pinout	Pin Define	Pinout	Pin Define
1	VSYS_IN	9	RS232_RX
2	VSYS_IN	10	GND
3	GND	11	SOP0
4	NRST	12	SOP1
5	INTR	13	SPI_MOSI
6	UART_RX / CAN_RX	14	SPI_MISO
7	UART_TX / CAN_TX	15	SPI_CLK / I2C_SCL
8	RS232_TX	16	SPI_CS / I2C_SDA



Industrial Use Cases – 60GHz Low



Motion Detect



Presence Detect



Person Localization



Range Measure

Objective	Detect motion with rough person location	Detect person approach / present / leave (w/ gesture detect option)	Person location and tracking in 2D/3D space	Measure range to single target
Target Device	IWRL6432 (3RX / 2TX)	IWRL6432 PE (3RX / 2TX)	IWRL6432 (3RX / 2TX)	IWRL6432 (Only 1RX / 1TX needed)
End Equipments	Building Security Systems Appliances	Notebook PCs Personal / Home Electronics	Building Security Systems Video Surveillance Automated Doors	Displacement Transmitters
Sensing System key-features	<ul style="list-style-type: none"> • Detect minor motions, person sitting, typing (indoor only) • Determine if motion detected in coarse region of interest, trigger GPIO to wake-up external processor • Programmable motion thresholds based on range and angle zone • <u>External processor</u>: Classification of human vs non-human objects 	<ul style="list-style-type: none"> • Detect presence of person who has approached interface • Configurable motion thresholds based on range and angle zone • Raw ADC & point cloud output opts • <u>External Processor</u>: Recognize human vs non-human • <u>External Processor</u>: Additional features such as Gesture recognition 	<ul style="list-style-type: none"> • Location of up to 3 people • May switch from 'Motion Detect' mode to conserve power • <u>TBD</u>: Tracker required? • <u>External processor</u>: Classification of human vs non-human objects to prevent false detection. • <u>External processor</u>: Classification of human stance/behavior 	<ul style="list-style-type: none"> • Detect distance to single target with mm accuracy
Range (max)	~5 to 20m	≤ 1.5m	~10 to 20m	< 5m
Power (Avg) / Duty-Cycle	< 5mW / 4Hz (indoor) < 25mW / 4Hz (outdoor)	< 2mW / 2Hz est	< 10mW / 4Hz (indoor) < 25mW / 4Hz (outdoor)	System: 240mW, (12V @ 4-20mA)
Power (Peak)	System Power: < 700mW	System Power: < 600mW	RF Power: < 700mW System Power: < 800mW	System Power: TBD
Power connectivity	Dual rail (single rail possible)	Dual rail (single rail possible)	Single or Dual rail	Current loop (4-20mA)
Sensor Connectivity	SPI, UART	SPI, connection to Sensorhub	SPI, UART	SPI, UART
Device Size	NFBGA	WCSP	NFBGA	NFBGA

Sources from TI

Functions/Applications/Power Consumption

Function	Performance	Avg. Power Consumption	End Equipment
Presence Detection	7 meters (localization)	2mW	Lighting Control, Indoor Occupancy Sensors, Thermostats, Appliances
Motion Detection	15 meters	10mW	Video Doorbell, Home Surveillance
Tracking and Classification	3+ person tracking	50mW	Doors/Gates, Surveillance with classification

IWRL6432 Device Power States

Mode	Description
Active	RF activity is present
Processing	Data is being processed and the RF/Analog Sub-System is turned off
Idle	State occurs during inter-frame/inter-burst/inter-chirp idle time
Deep Sleep	Lowest possible power state of the device where the contents of the device can be retained and the device need not boot from scratch

***Innovation, Self-motivation, Efficiency.
Utmost Customer Satisfaction.***

Thank you!

**Sales Dept.
sales@jorjin.com**