

Radar Sensing Technology and Application Systems

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eewebinar.co.kr / 무료 웹 세미나



Agenda

- 1 Fundamental of Radar Sensing Technology
- 2 Why we choose radar over other sensors?
- 3 Why we choose 24GHz and 60GHz?
- 4 How to apply radar on different application systems?
- 5 Infineon's 24GHz MMIC and Design Offerings
- 6 Radar Module Solution Providers
- 7 More Information on Infineon Web
- 8 Q&A

Fundamental of Radar Sensing Technology

What is **RADAR**?

“RADAR” is an acronym for **RA**dio **D**etection **A**nd **R**anging

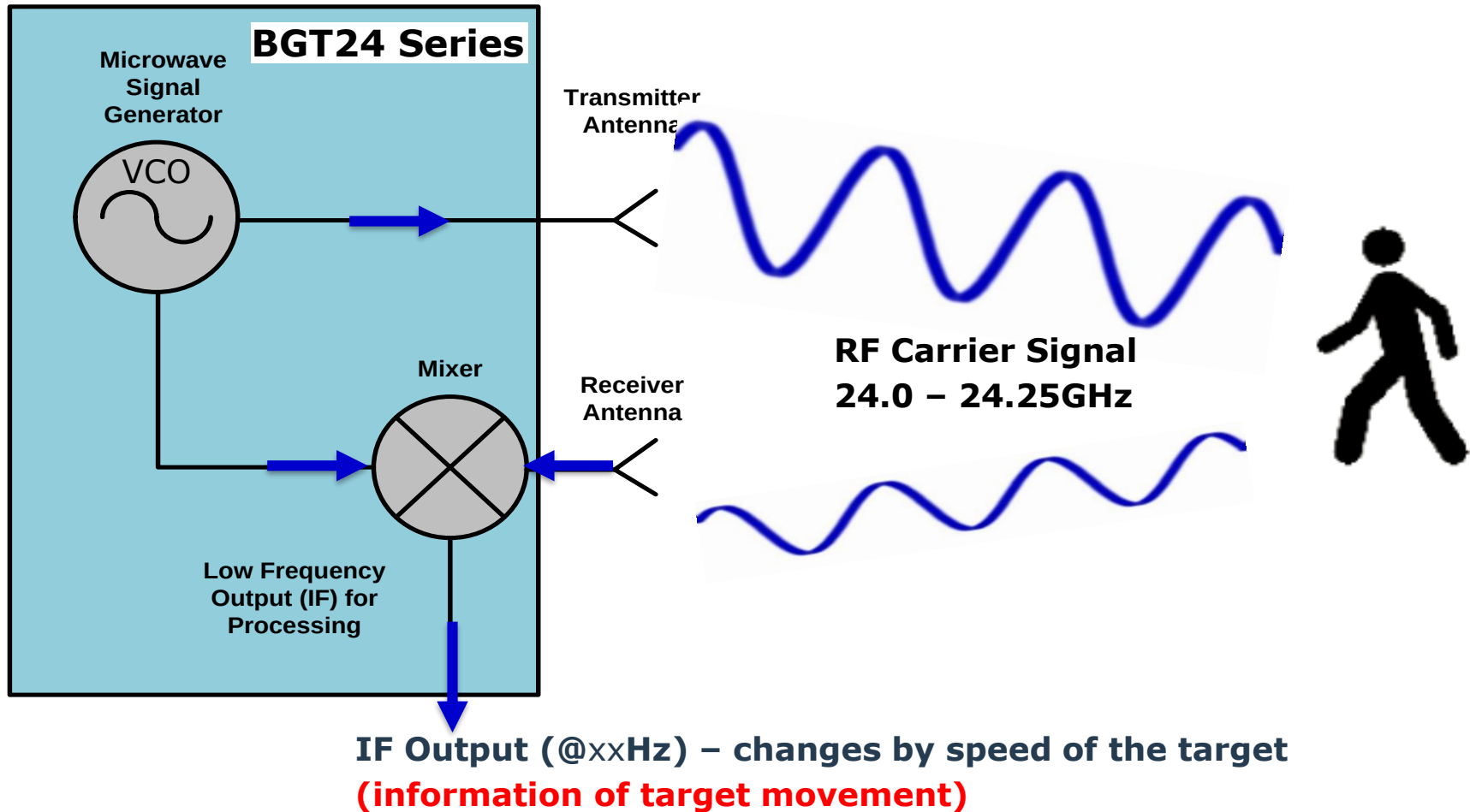


Source: www.radartutorial.eu

Fundamentals of Radar Technology

How RADAR Based Sensing Work?

IF (intermediate frequency) output = **Doppler** frequency or **Beat** frequency



Information obtainable from a typical **Radar Sensor**

Speed sensors



Speed/Velocity

- › Derived from Doppler shift in frequency



Range/Distance to target

- › Derived from measurement of electro magnetic wave



Angle sensor



Angle/Direction to target

- › Derived from phase difference at the antennas



Position sensor



Position of Object

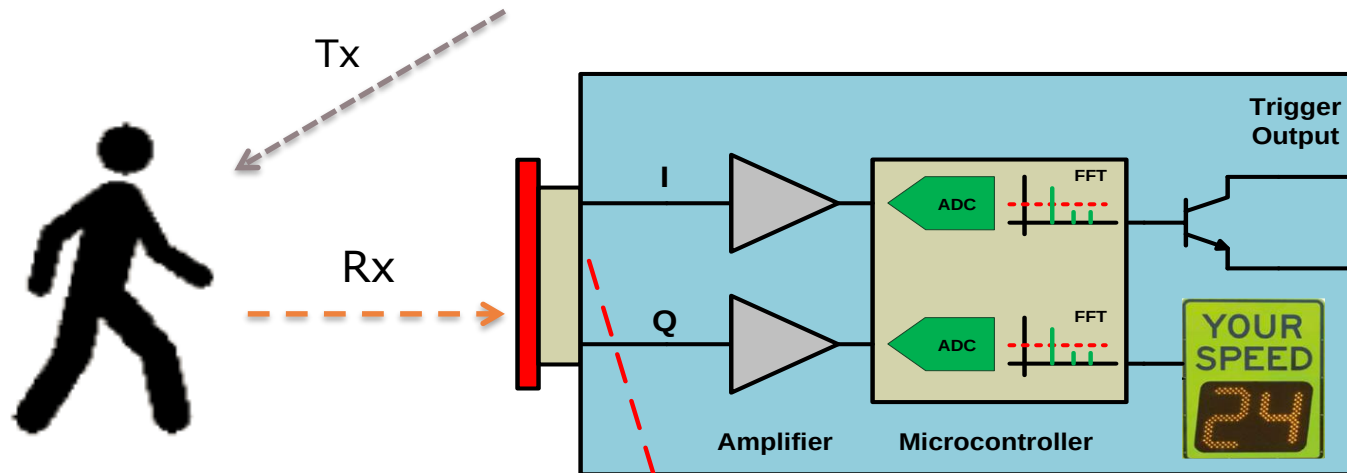
- › Derived from FMCW
(Frequency-modulated continuous-wave radar)



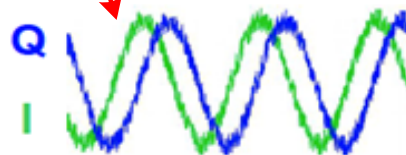
Continuous Wave Radar

Doppler Effect for **Direction** of Movement

Direction of movement from **Inphase (I)** & **Quadrature phase (Q)** output



90° phase shift between Radar transceiver with Inphase (I) and Quadrature phase (Q) output gives the direction of movement



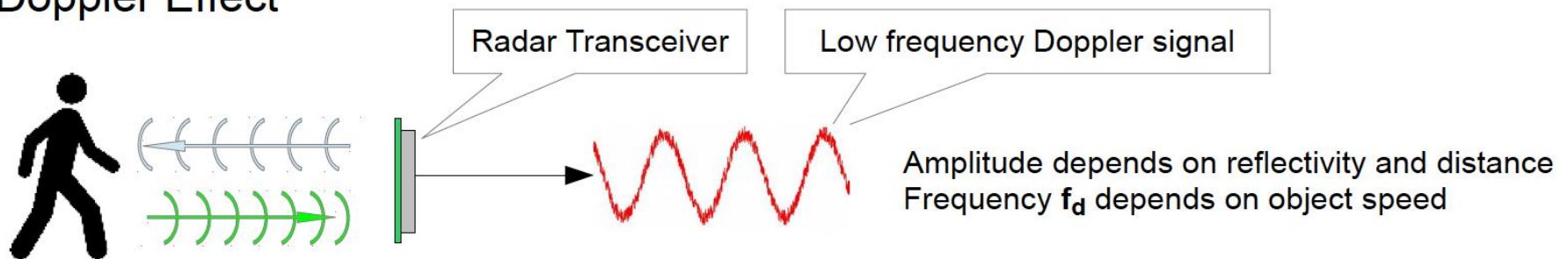
Source: RF Beam Microwave GmbH

Continuous Wave Radar

Doppler Effect for **Speed** Measurement

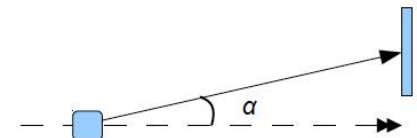
Speed can be calculated by **Doppler frequency shift**

Doppler Effect



Calculating the Doppler frequency

$f_d = \frac{2 \cdot f_{Tx} \cdot v}{c_0} \cdot \cos \alpha \quad (1)$ or $v = \frac{c_0 \cdot f_d}{2 \cdot f_{Tx} \cdot \cos \alpha} \quad (2)$	f_d Doppler frequency f_{Tx} Transmit frequency (24GHz) c_0 Speed of light ($3 \cdot 10^8$ m/s) v Object speed in m/s α Angle between beam and object moving direction
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At a transmit frequency of $f_{Tx} = 24.125\text{GHz}$ we get a Doppler frequency for a moving object at the IF output of

$$f_d = v [km/h] \cdot 44\text{Hz} \cdot \cos \alpha \quad \text{or} \quad f_d = v [m/s] \cdot 161\text{Hz} \cdot \cos \alpha \quad (4)$$

Source: RF Beam Microwave GmbH

Continuous Wave Radar

Distance Measurement - Continued

FMCW and FSK

Measuring distances need modulation of carrier → bandwidth

	FMCW (Frequency Modulation Continuous Wave)	FSK (Frequency Shift Keying)
Use	For stationary and moving objects	For moving objects only
Modulation		
Formula	$R = \frac{c_0}{2} \cdot \frac{f_b}{f_M} \cdot \frac{T_M}{2}$	$R = \frac{c_0 \cdot \Delta \phi}{4 \pi \cdot (f_a - f_b)}$
Resolution	1m, limited by K-Band bandwidth 250MHz	1 - 100 cm, depending on signal processing

Resolution is limited by the bandwidth used as per the formula below

$$\text{Range Resolution} = \frac{c}{2BW}$$

Where
 C = Speed of Light
 BW = Bandwidth

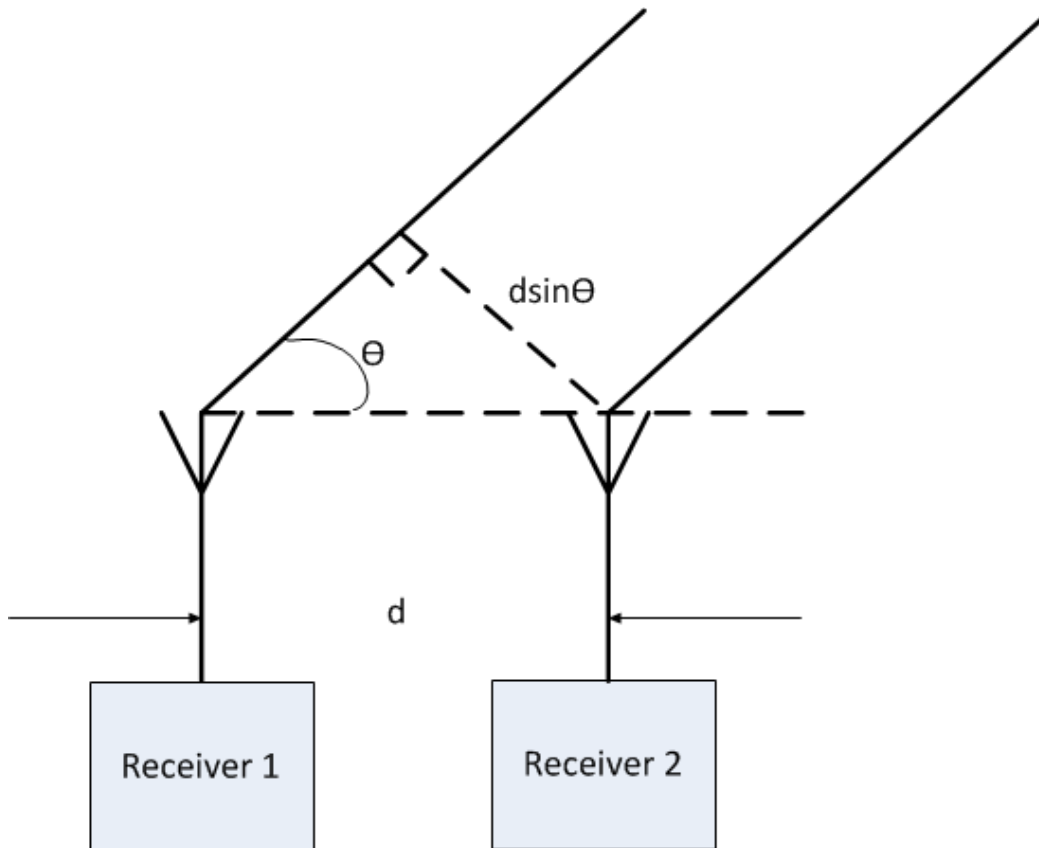
Range Resolution denotes the minimum spacing required between two targets, for detection with the RADAR

Ex.1 – 24.05-24.25GHz (BW=200MHz) -> Range Resolution = **75cm**

Ex.2 – 57-64GHz (BW= 7GHz) -> Range Resolution = **2cm**

Source: RF Beam Microwave GmbH

Phase shift of Multiple Receiver Antennas gives **Angle of Arrival**



Angle of Arrival Calculation

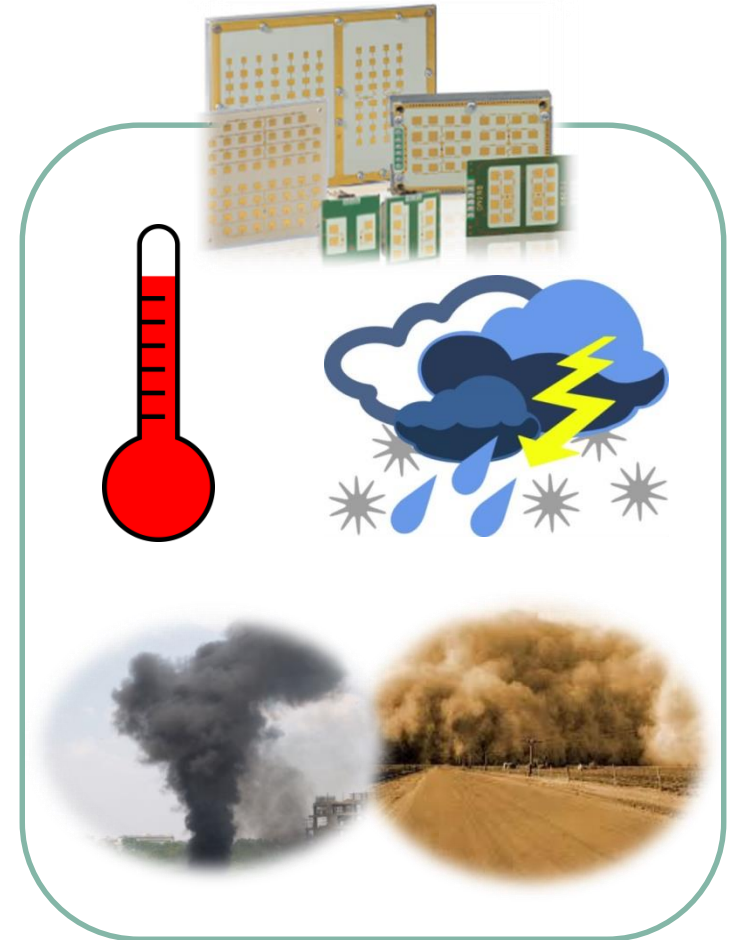
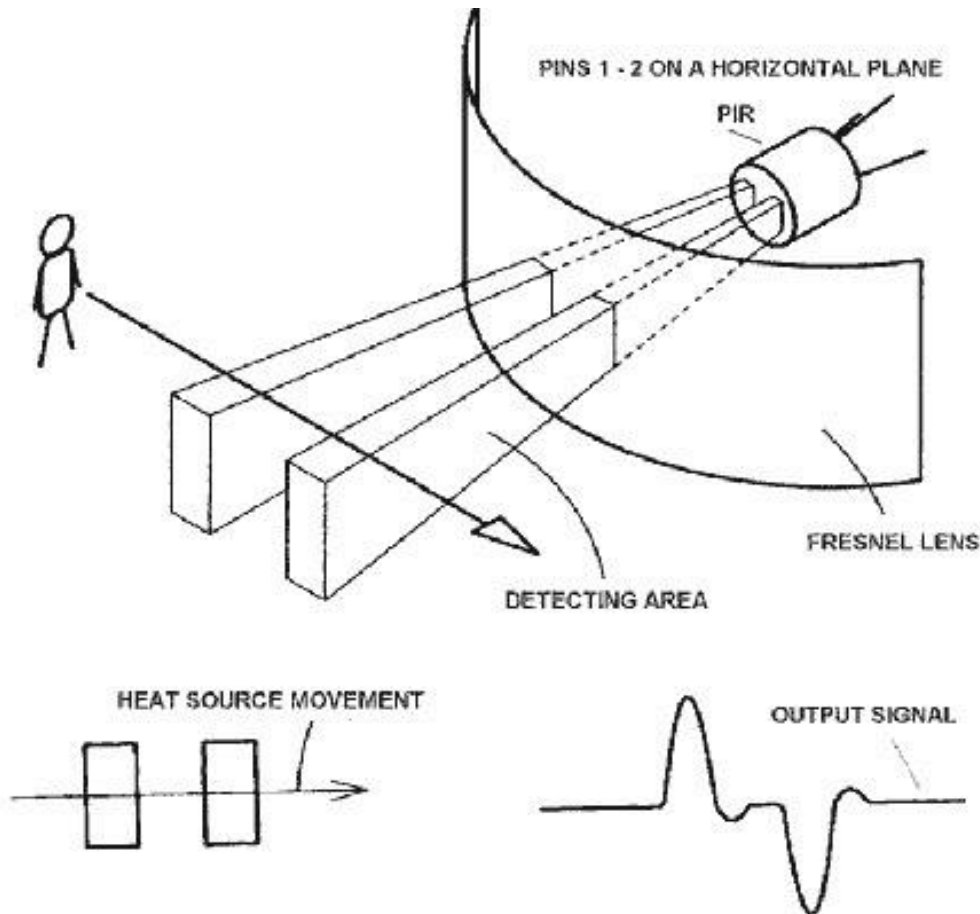
$$\theta = \sin^{-1} \left(\frac{\lambda \Delta \phi}{2\pi d} \right)$$

Source: RF Beam Microwave GmbH

Radar Operating Mode	Movement	Velocity	Distance	Presence
Pulsed	X	X	X	
Continuous Wave (CW) – Doppler Radar	X	X		
Frequency Modulated Continuous Wave	X	X	X	X

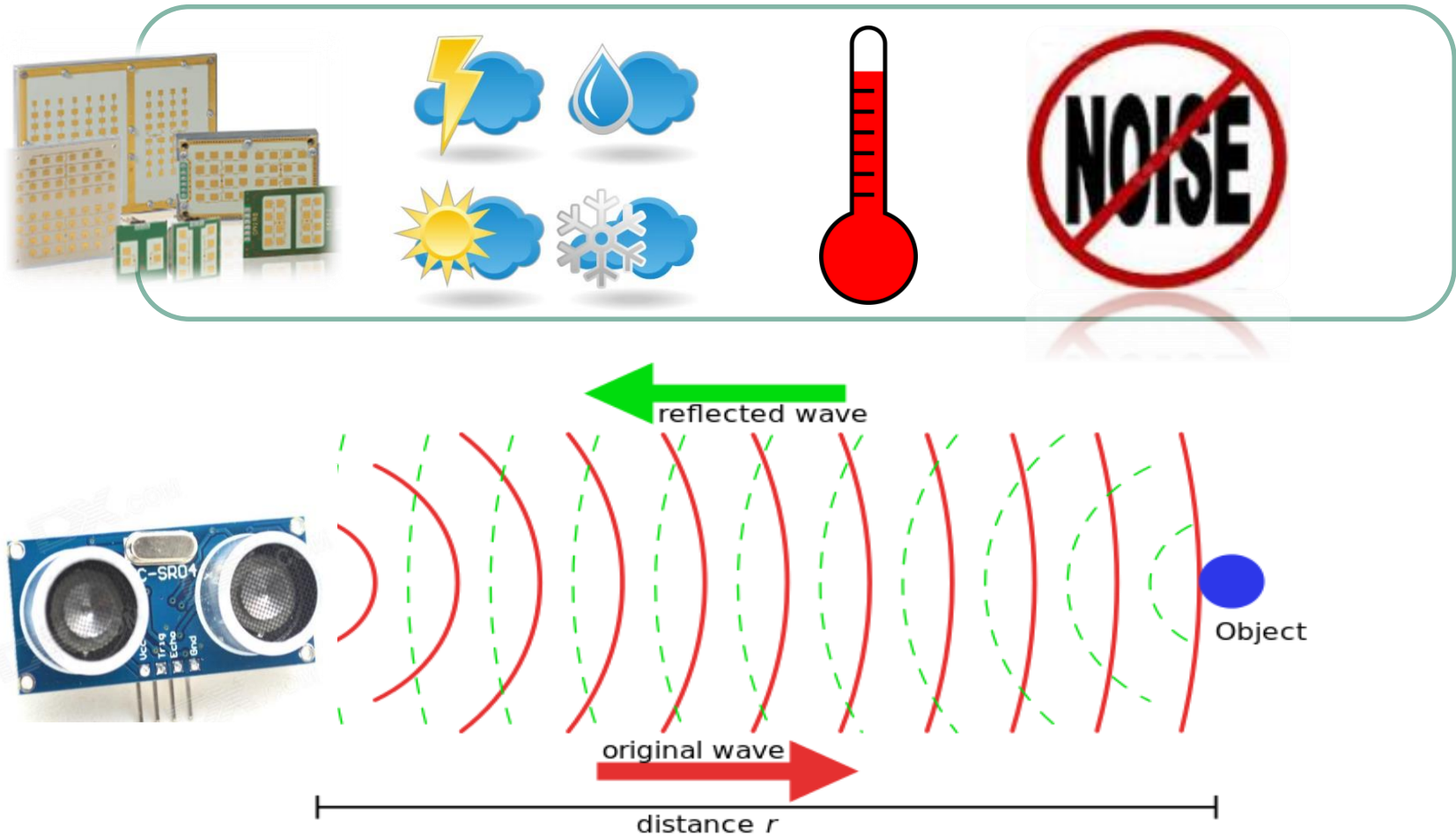
Why we choose radar over other sensors?

Passive Infrared Detectors (PIR)



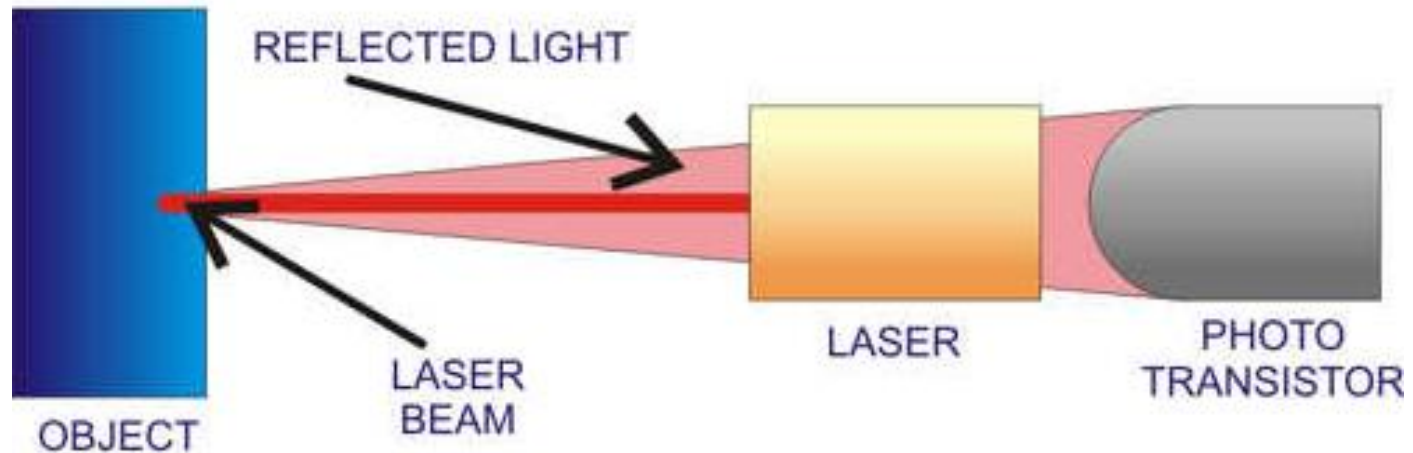
Overview of Existing Motion Detection Schemes (cont'd)

Ultrasonic Detector

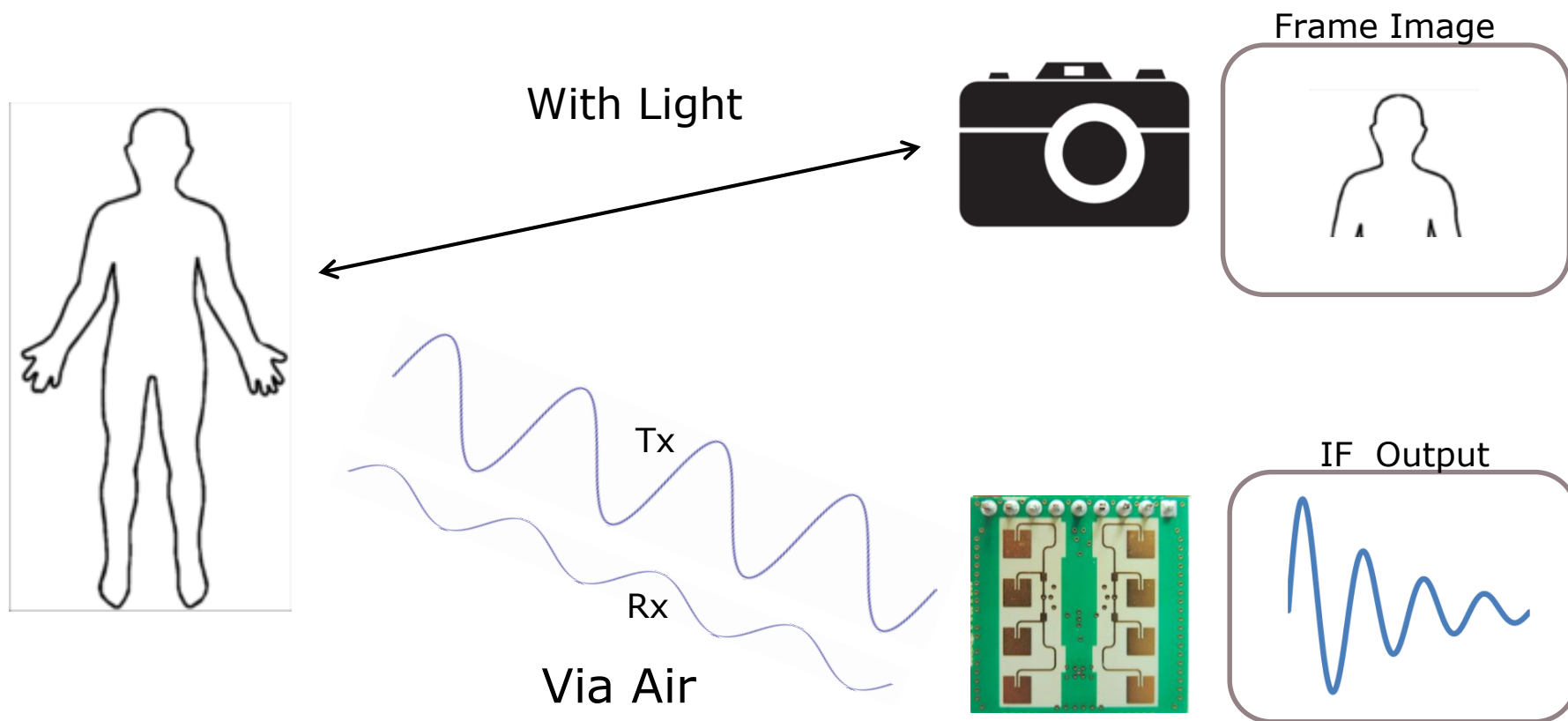


Overview of Existing Motion Detection Schemes (cont'd)

Laser (Lidar) Technology

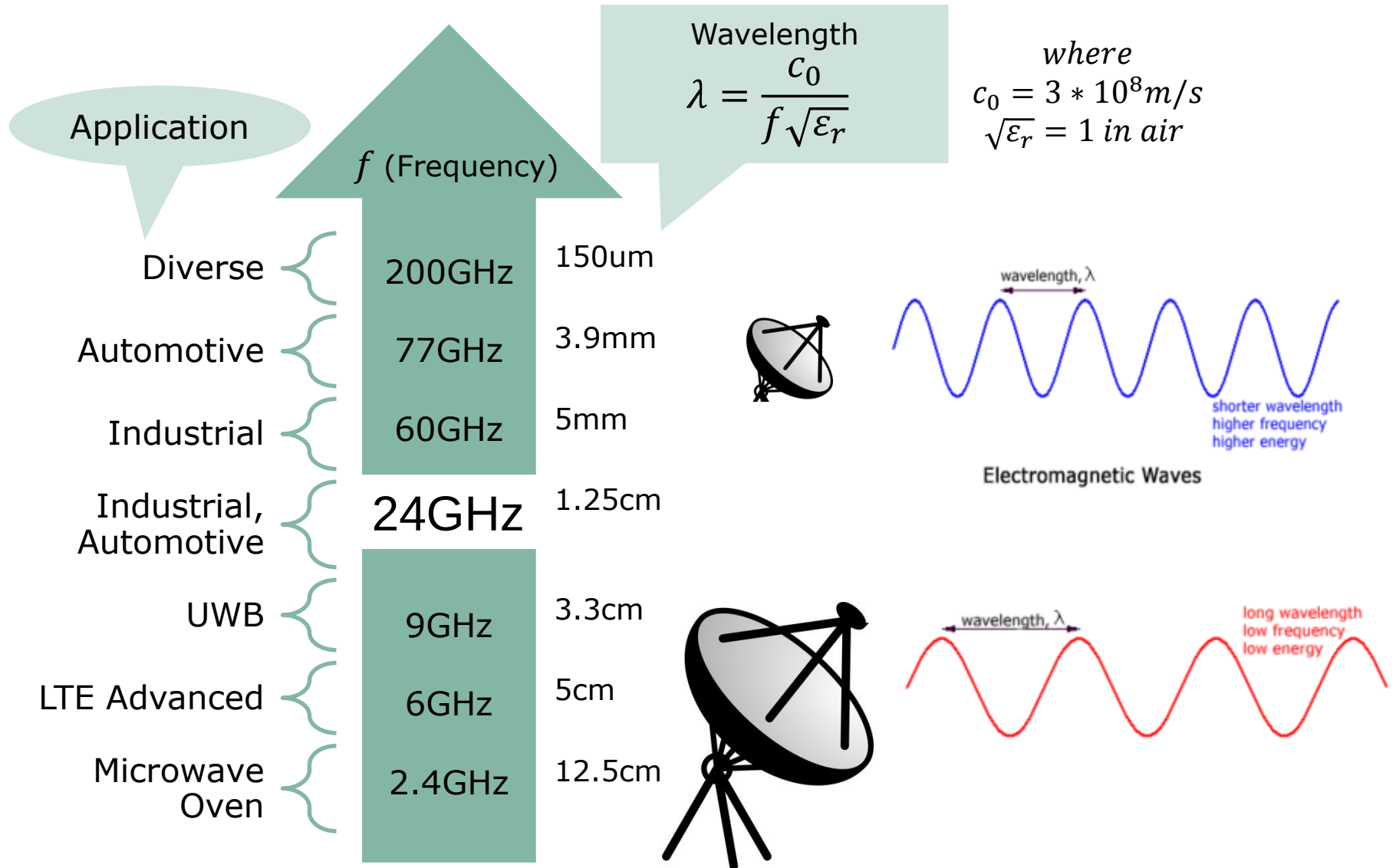


Camera (Vision) vs. Radar sensor

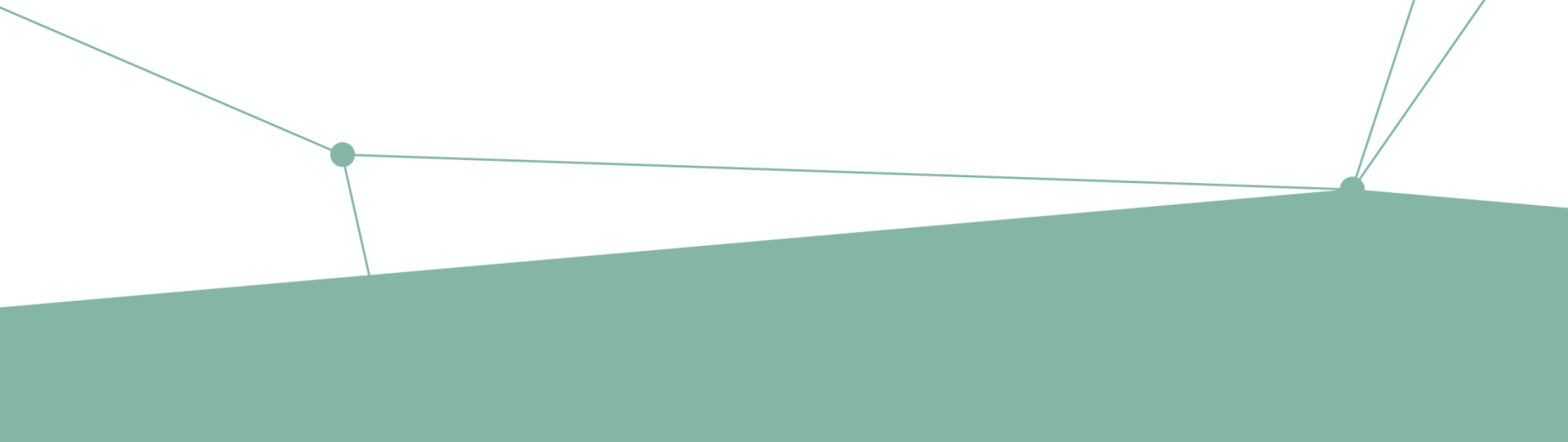


Why we choose 24GHz?

Frequency/Wavelength determines Size of Antenna



How to apply radar on different application systems?



Infineon addresses a broad set of IoT market segments which are open for Radar Applications



Smart vehicles



Smart cars

- › ADAS / autonom. driving
- › Car security
- › (H)EV



CACV

incl. Trucks & Busses

- › ADAS / autonom. driving
- › (H)EV



Other forms of transport

- › Commercial aircraft
- › Ships (ferry & container)
- › Light electric vehicles

Smart city & energy



Energy & infrastructure

- › Energy Saving
- › Utilities, traffic, outdoors
- › Environmental sensors



Building automation

- › Automation
- › Access control
- › Air conditioning
- › Elevators/escalators



Professional lighting

- › Building lighting
- › Street lighting
- › etc.

Smart industry & business



Factory automation

- › Industrial automation
- › Industrial robotics



Medical equipment

- › Vital sensors
- › Diagnostics
- › Rehabilitation systems



Other businesses

- › e.g. Banking & securities, education, mining, retail and wholesale, transportation and logistics

Smart home & consumer devices



Smart home

- › Home automation incl. home appliances
- › Home energy management
- › Home security & safety
- › Lighting



Smartphones, tablets & PCs

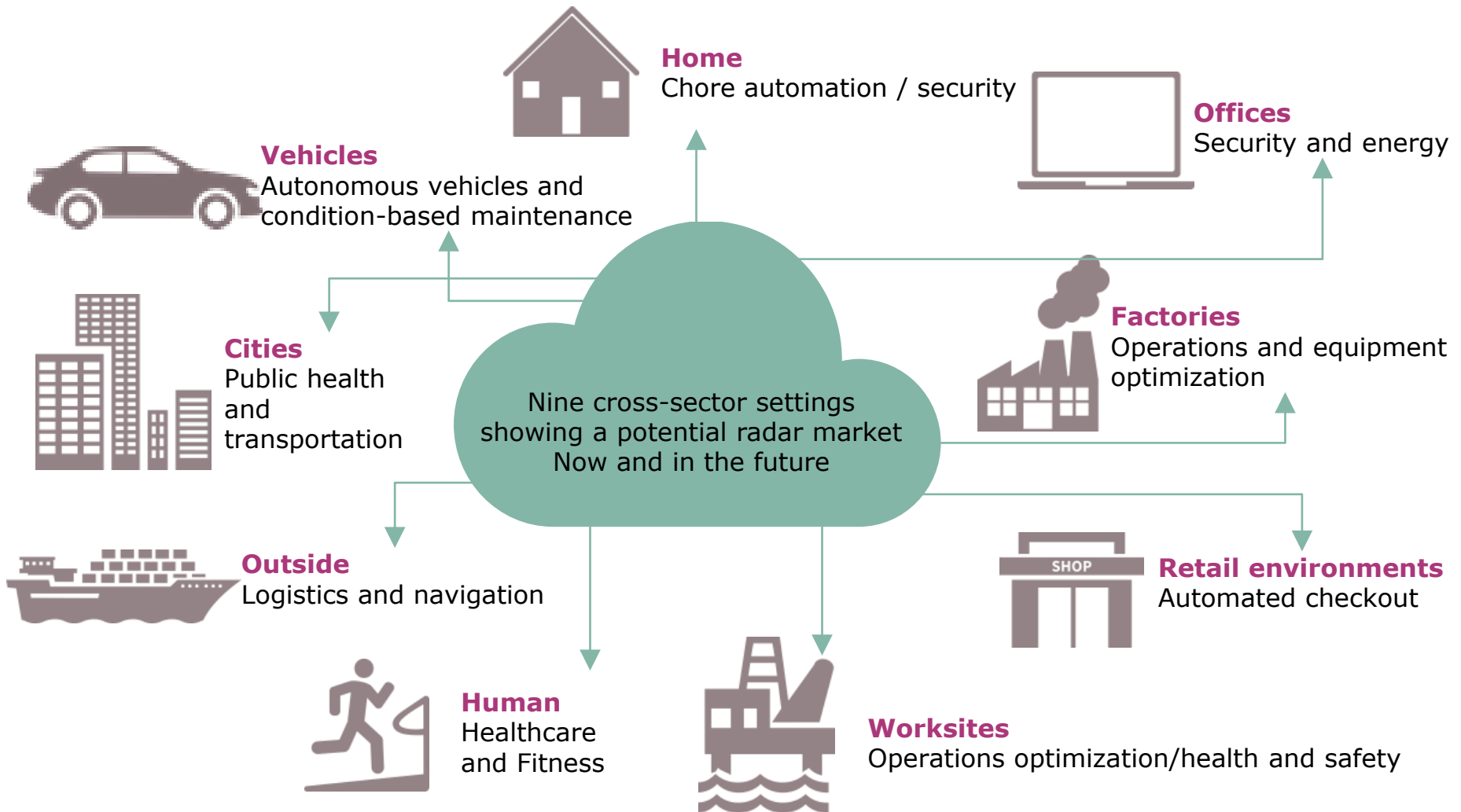


Consumer electronics & wearables

- › Media players, smart glasses, smart watches
- › Well-being, assisted living

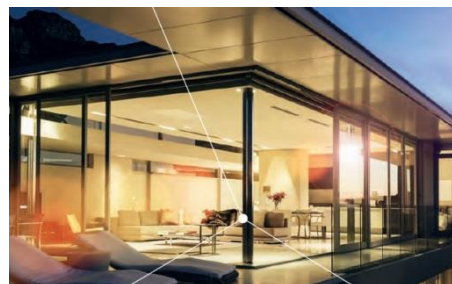
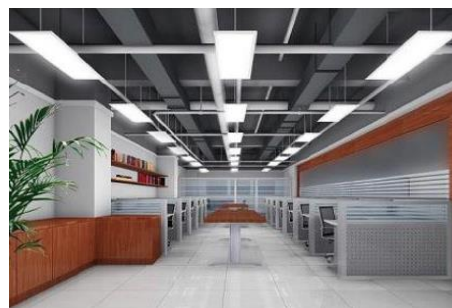
Starting with Automotive, Consumer and Industrial market is the future

Radar will play a role of “Smart sensing” across multiple markets



Presence Detection, Position Sensing, Gesture Sensing...

24GHz Radar Application Cloud for IoT



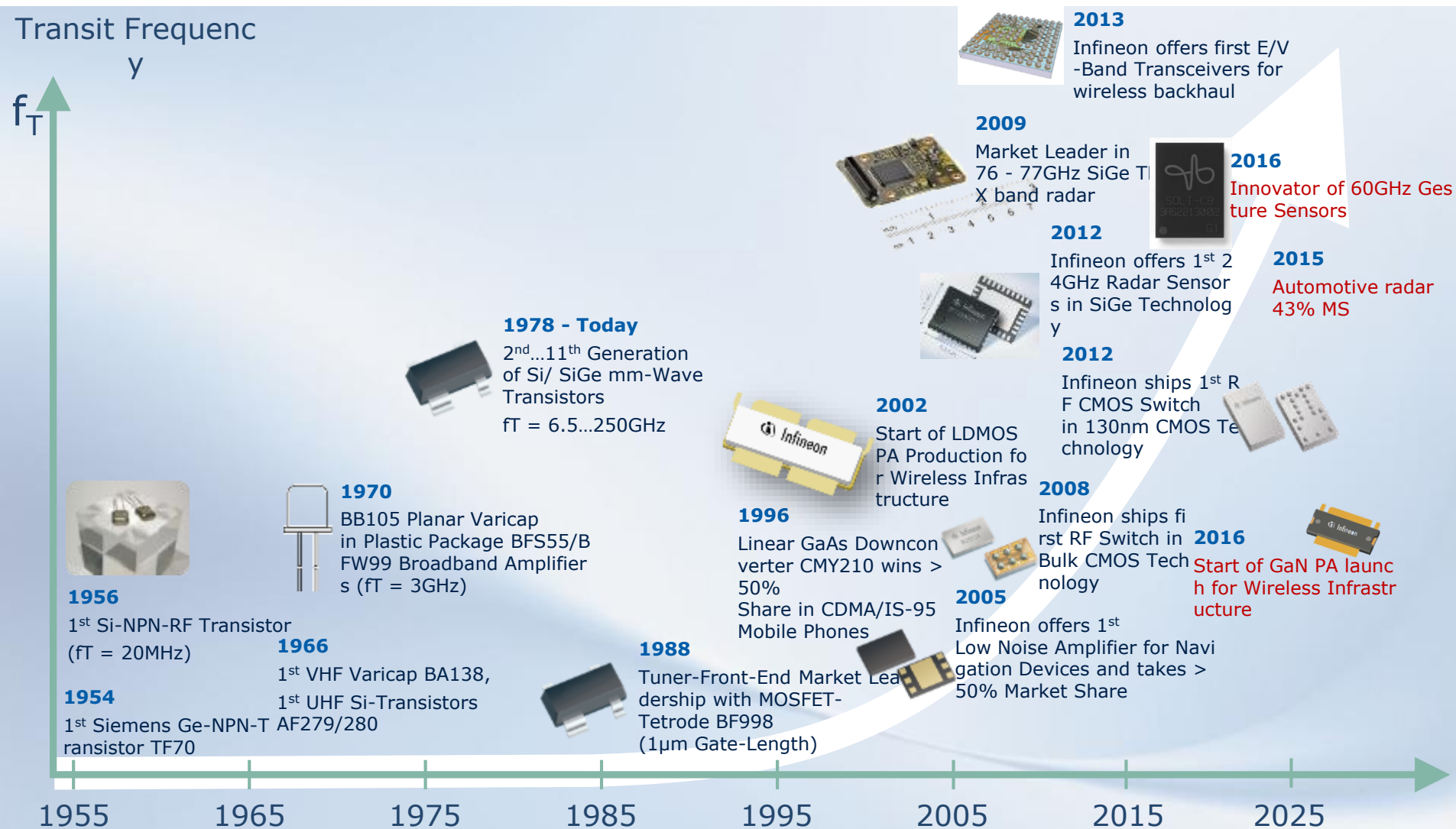
- **Smart and Energy Efficient Home and Office Lighting**
 - Movement and presence based light activation
- **Intelligent Door Openers**
 - Direction of movement based intelligence
- **Smart Security Sensors/Intrusion Detection**
 - Fusions systems with radar and camera for home and building security systems based on movement detection
- **Smart and Energy Efficient Air Conditioners**
 - People movement and presence detection based operation.
- **Smart Home Appliances**
 - Refrigerators, Robot cleaners etc operating based on movement and proximity detection
- **Smart Drones**
 - Collision Avoidance & Altimeter
- **Health Monitoring**
 - Patient monitoring systems



Information from all above Radar Sensor driven applications can be shared via a common hub over the Internet.

Infineon's 24GHz MMIC and Design Offerings

For more than 60 years Infineon Technologies has been setting market standards in all RF Segments



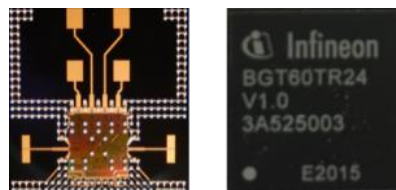
Infineon mmWave MMICs Portfolio

24GHz Radar MMICs



- Automotive application
- Industrial application
- Consumer application
- Presence and motion detection
- 24.0-24.25GHz ISM band
- 250MHz bandwidth

60GHz Radar MMICs



Package Dimension: 12.0mm x 12.5mm x 0.8mm

- Gesture Recognition and Sensing
- Industrial and Consumer app.
- 57.0-64.0GHz
- 7GHz bandwidth
- Antenna integrated in eWLB package

60, 70 & 80GHz Communication MMICs

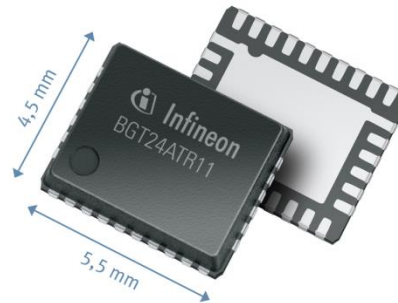


- Backhaul Communication app.
- V band: 57 to 64GHz
- E band: 71 to 76GHz
- E band: 81 to 76GHz
- Available in eWLB package

Infineon 24GHz MMICs for Automotive Short/Mid Range Radar

Automotive Short Range Radar

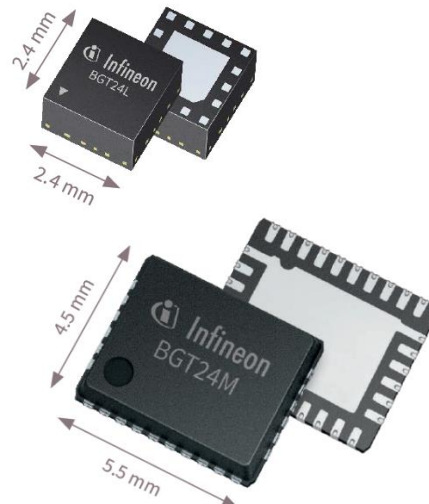
BGT24A Series



4.5x5.5mm

- Qualified according **AEC-Q100**
- Fully ESD protected
- VQFN-32-9 leadless package
- 2Tx+4Rx two chip
- 1Tx2Rx+2Rx two chip
- 1Tx2Rx – one chip
- Temp spec: **-40°C ~ +125°C**
- Pb-free (RoHS compliant) package

Industrial & Consumer Radar Application



- 24GHz ISM band transceiver
- 1Tx-1Rx one chip MMIC
- 1Tx-2Rx one chip MMIC
- 1Tx-2Rx+2Rx extension possible
- Smallest 24GHz 1Tx1Rx MMIC package in Industry
- 2.4x2.4mm

BGT24 – Product Portfolio at Infineon Automotive Application



1st Generation



BGT 24ATR11

1 Tx and 1 Rx
Automotive qualified



BGT 24ATR12

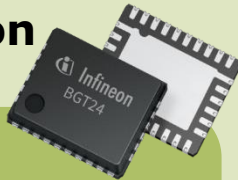
1 Tx and 1 Rx
Automotive qualified



BGT 24AR2

2 Rx
Automotive qualified

2nd Generation



BGT 24AT2

2 Tx
Automotive qualified



BGT 24AR4

4 Rx
Automotive qualified

Possible Configurations with our portfolio

	1Rx	2Rx	3Rx	4Rx
1Tx	BGT24ATR11	BGT24ATR12	BGT24ATR11 + BGT24AR2	BGT24ATR12 + BGT24AR2
2Tx		BGT24AT2 + BGT24AR2		BGT24AT2 + BGT24AR4

24GHz RADAR development platform

Automotive Blind Spot Detection Application



BGT24ATR12

1 TX-antenna (10x60° angle)

Power /CAN

Ethernet (RJ-45)

TC264D AURIX Prozessor

2 RX-antennas (10x85° angle)
Tracking of objects up to 50m.

Blind Spot Detection

Target control: Target ID: 1, Target Threshold: 4000, Cap. around target: 1, Filter (SRR, 100Hz): OFF, RCS Compensation: ON.

Chip set control: Detected chip set: 10, RX Gain (dB): 10, Speed range (km/h): 10.0, TX antenna: T10, RX antenna: R00, SPI (Slave ID): 0000.

Targets: 5, Sequence: 250. Range plot (m) vs Angle (°) and Angle plot (°) vs Speed (km/h).

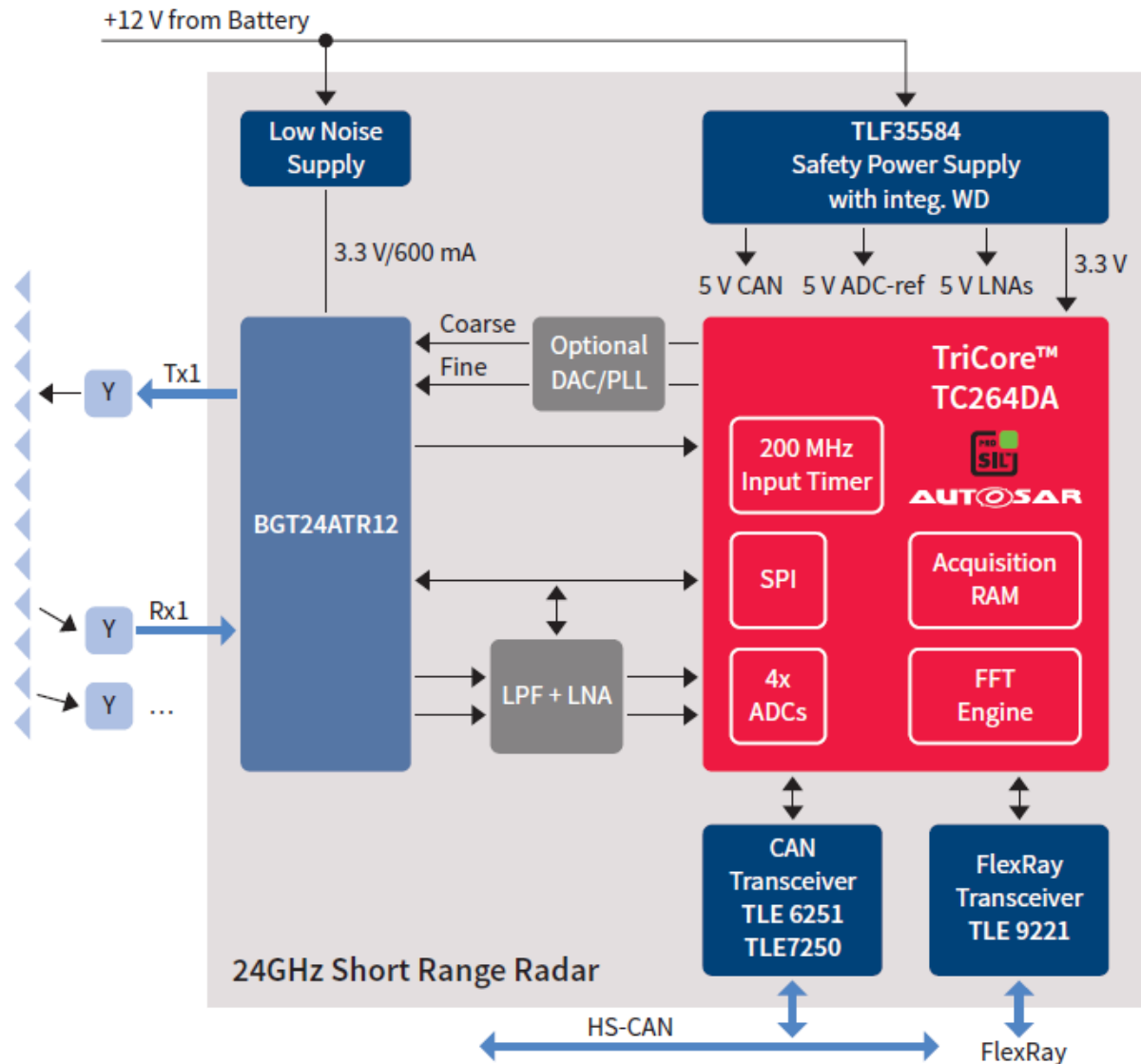
- › All documents to produce hardware (Gerber-files, BOM, schematics)
- › Source code for AURIX and PC-Software (GUI)
- › Documentation including protocol description and start-up guide

› **Now Available for customers**

24GHz RADAR development platform

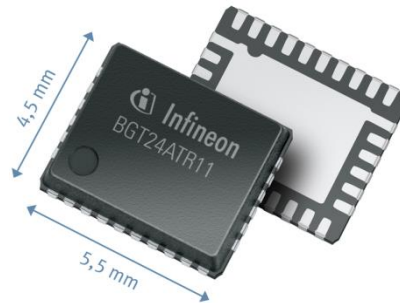
Automotive Blind Spot Detection Application

- > **KIT_AURIX_BGT24A_RADAR**
- > **BGT24ATR12**
 - AEC-Q100 qualified.
- > **TC264DA AURIX™ MCU**
 - TriCore™ 250 MHz
 - 2.7 MB SRAM
- > **Antenna included**
 - 1 Tx (10 x 60°)
 - 2 Rx (10 x 85°)
- > **10/100 Mbit Ethernet connection**
- > **1 Mbit/s CAN bus control**
- > **8 – 14 VDC Power supply**
- > **Two-stage IF amplifier**
- > **User LEDs/buttons**
- > **Firmware**



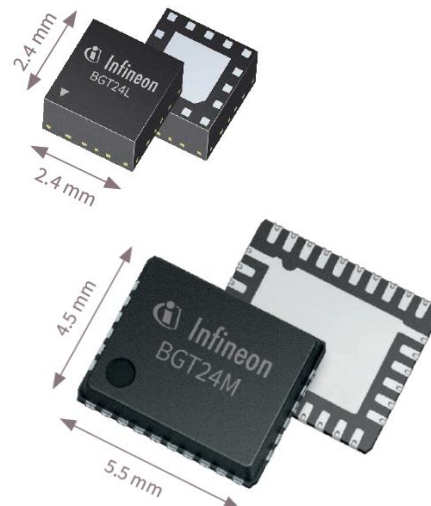
Infineon 24GHz MMICs for Multi-Market Radar application

Automotive Short Range Radar



- Qualified according AEC-Q100
- VQFN-32-9 leadless package
- 2Tx + 4Rx two chip
- 1Tx-1Rx + 2Rx two chip
- 1Tx-2Rx – one chip
- 4.5x5.5mm
- Pb-free (RoHS compliant) package

Industrial & Consumer Radar Application



- 24GHz ISM band transceiver
- 1Tx-1Rx one chip MMIC
- 1Tx-2Rx one chip MMIC
- 1Tx-1Rx+2Rx extension possible
- Fully ESD protected
- Smallest 24GHz 1Tx1Rx MMIC package in Industry
- 2.4x2.4mm / 4.5x5.5mm
- Pb-free (RoHS compliant) package

BGT24M/L – Product Portfolio at Infineon

Multi-Market Application/Low-power Application



1st Generation



BGT 24MTR11

1 Tx and 1 Rx
Industrial & Consumer



BGT 24MTR12

1 Tx and 2 Rx
Industrial & Consumer



BGT 24MR2

2 Rx
Industrial & Consumer

2nd Generation



BGT 24LTR11

1 Tx and 1 Rx
Smallest PKG in Industry
Ultra Low power

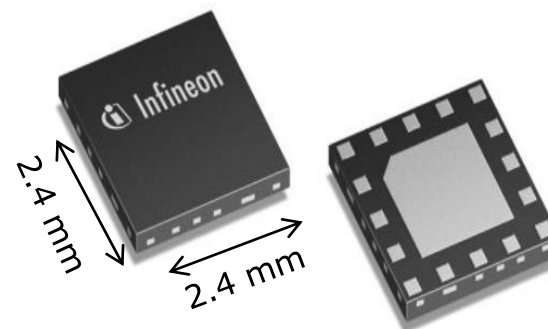
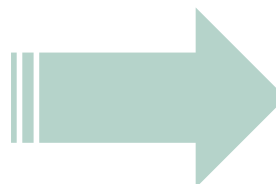
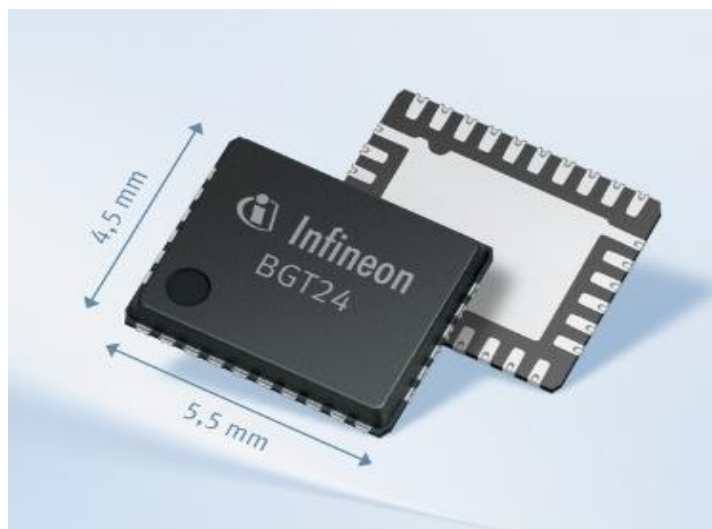
Infineons 24GHz Radar MMIC Offerings

BGT24MTR11	BGT24MR2	BGT24MTR12	BGT24LTR11
- Transceiver 1Tx+1Rx/ I Q differential - VCO integrated, SPI - Power/temp sensor <u>RF_{in} 24.0-26.0 GHz</u> 500 mW @3.3 V 4.5x5.5 mm -VQFN-32	- Twin receiver 2Rx/ IQ differential <u>RF_{in} 24.0-26.0 GHz</u> 300 mW @3.3 V 4.5x5.5 mm -VQFN-32	- Transceiver 1Tx+2Rx / I Q differential - As TR11 700 mW @3.3 V 4.5x5.5 mm -VQFN-32	- Transceiver (1Tx+1Rx) - Single-ended - BITE Tested - RF_{in} 24.0 – 24.25 GHz 150 mW @3.3 V 2.4 x 2.4 mm -TSNP-16

Lower Power

Lower cost

Smallest footprint



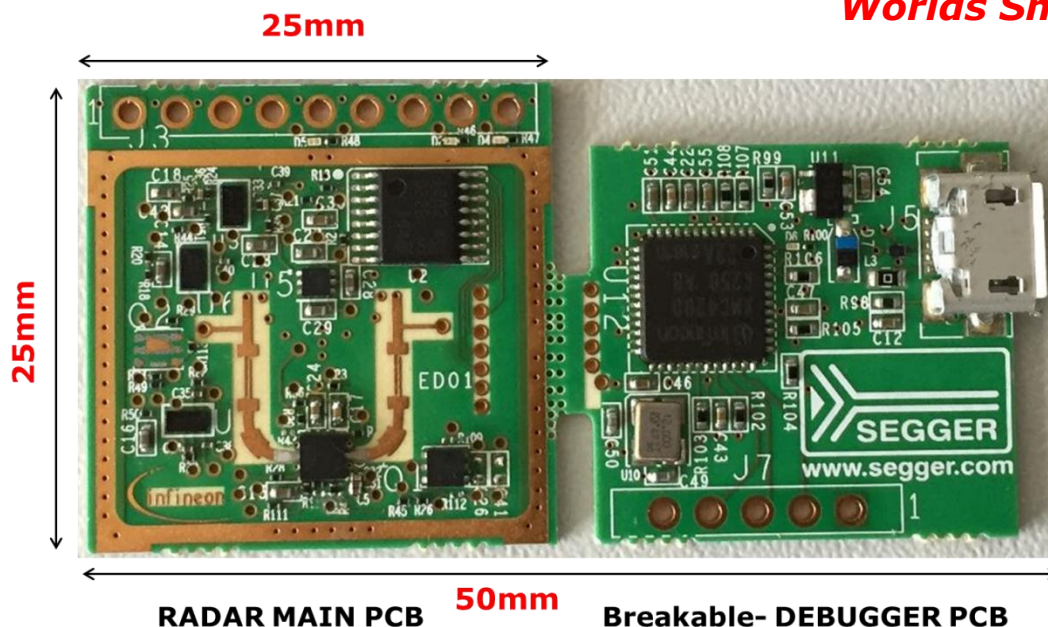
2015

Availability

Today

Sense2GoL demo board Overview

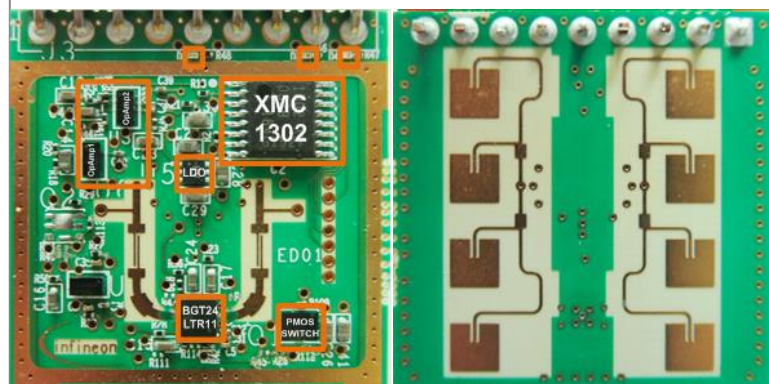
Worlds Smallest Fully Integrated Radar Module



Kit contents

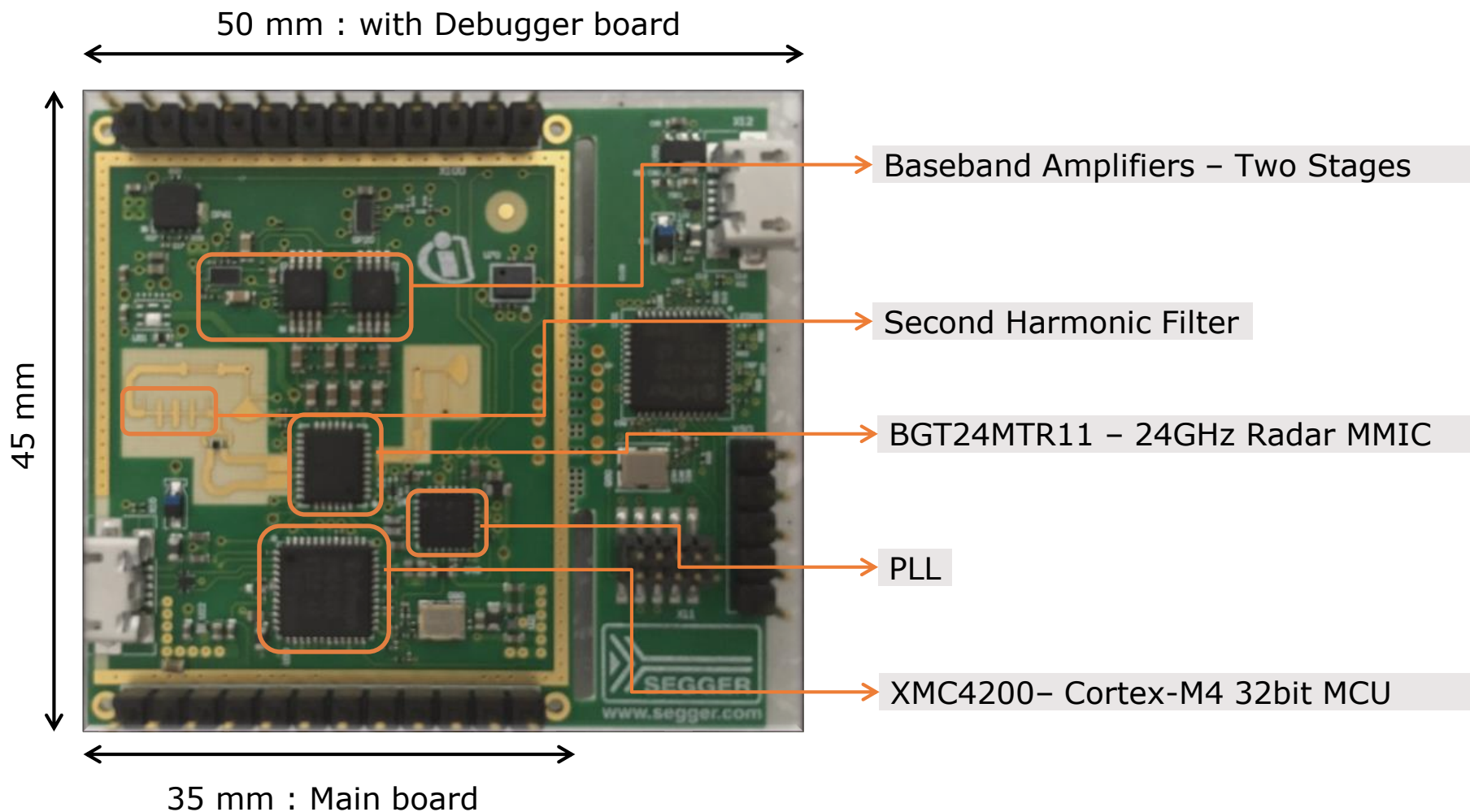
- › User manual
- › Firmware for Motion Detection
- › SW GUI for Radar Signal Observation
- › PCB Schematic and Gerber files

Key Features of the Sense2GoL Demo Board

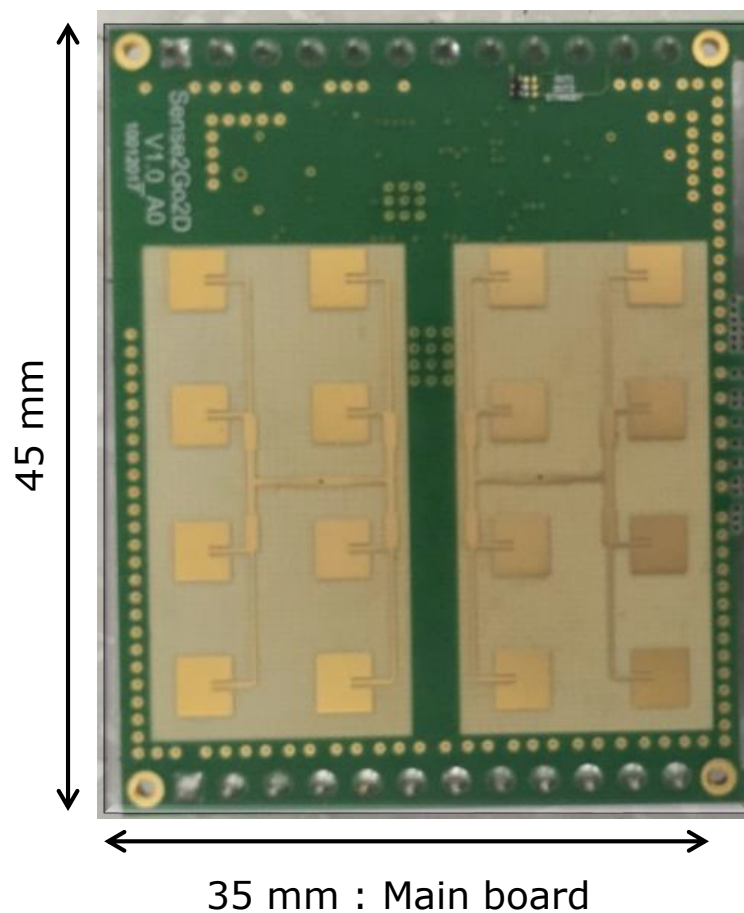


- › **BGT24LTR11** – 24 GHz highly integrated low power M MIC
- › **XMC1302 ARM® Cortex™-M0** – 32 bit industrial Microcontroller
- › **Multiple Integrated patch antennas available** (Default 1x4 with FOV = 28°x80°)
- › **Segger Debugger breakoff board for reprogramming**

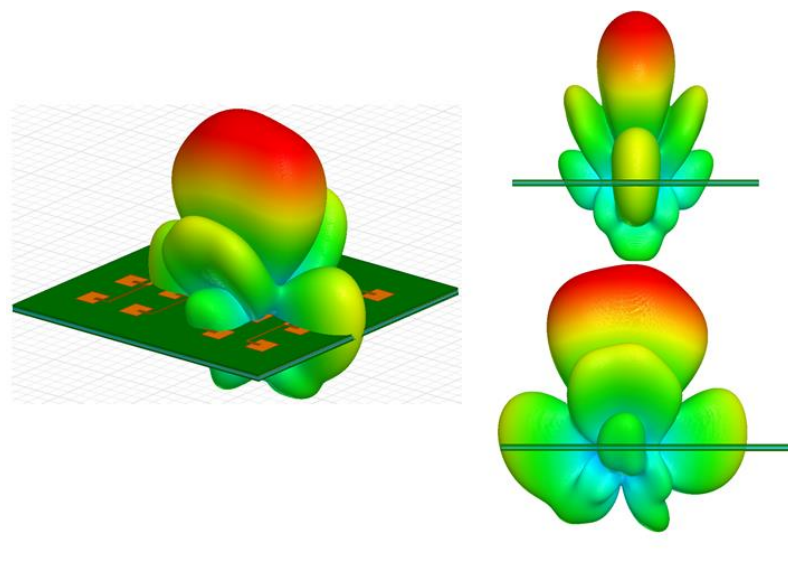
Distance2Go demo board Overview



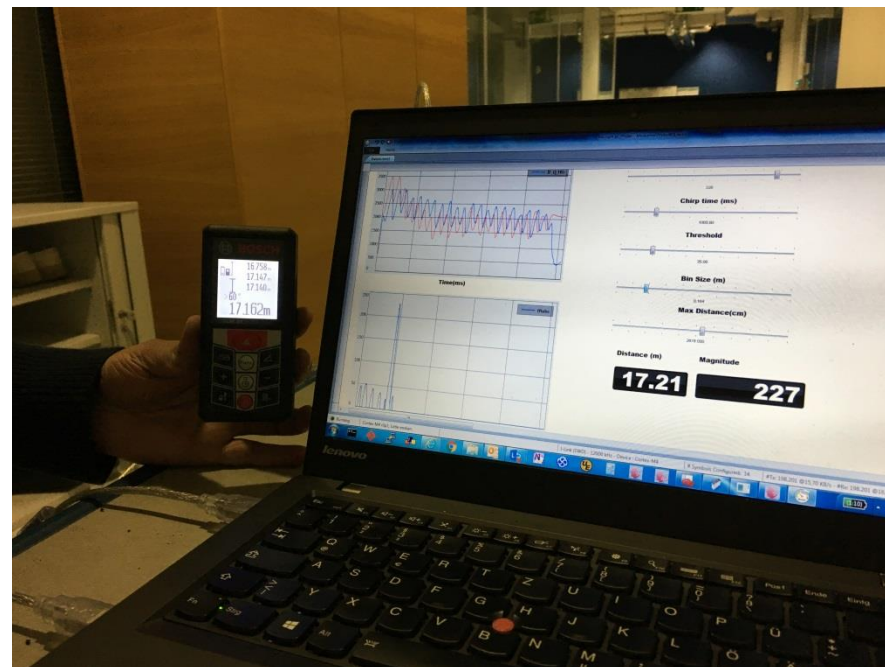
Distance2Go Antenna Overview



- > **2x4 Antennas**
 - > **13dBi Gain**
 - > **20x42° Opening Angle**



First Performance Measurement

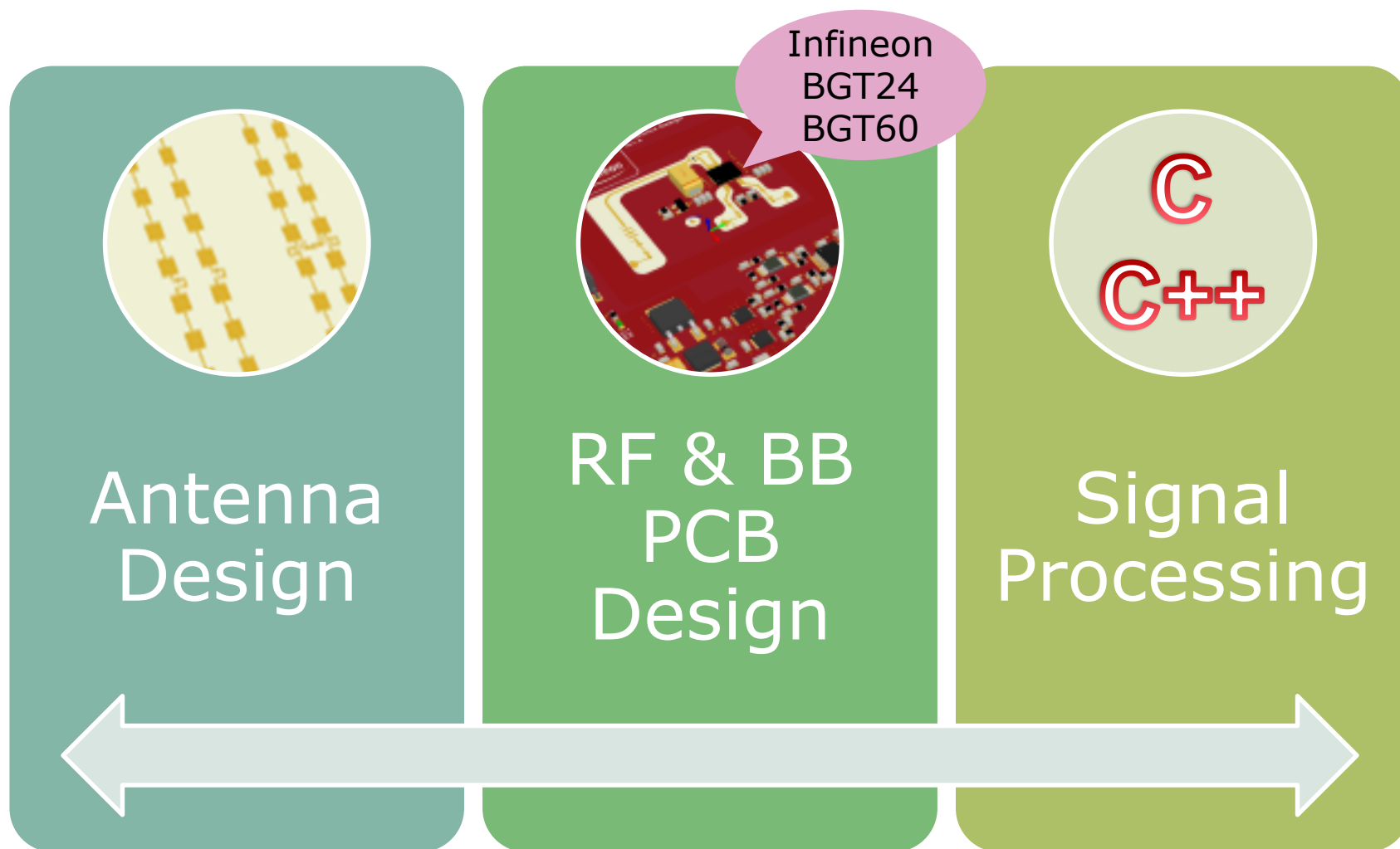


- › Measured a Wall upto 17m Successfully
- › Accuracy = +-10cm
- › Humans Measured upto 8m with same accuracy

Board will be available › 2H2017

Radar Module Solution Providers

Radar System Design Requirements

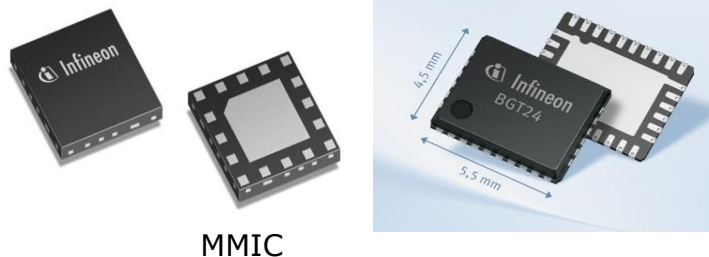


Infineon's MMIC to Complete System offering

Features

- > Radar-based motion detector operating in the 24 GHz ISM-Band
- > 4 MMIC Chips available

IFX MMIC



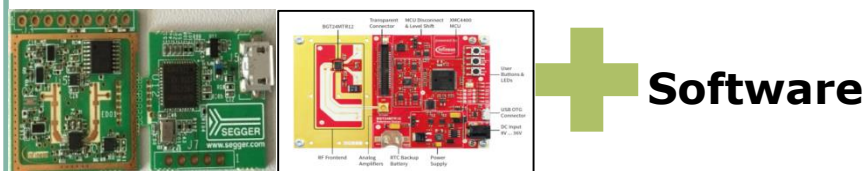
Benefits

- > Long range distance detection of moving objects up to 50 m
- > Wide range speed detection up to more than ± 100 km/h

Features

- > 3 System Boards available
- > All include 24GHz radar and XMC™ microcontroller
- > Kit contains User manual, GUI, MATLAB compiler and Gerber files
- > Requires Software

IFX Development Kit



Demokit with SW, Reference design

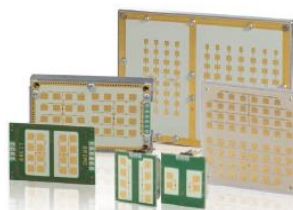
Benefits

- > Capability to detect motion, speed and direction of movement (approaching or retreating), distance and Angle of Arrival based on hardware
- > FW/SW for available for each radar mode

Features

- > Complete module, including radar MMIC, antenna options, MCU Signal processing options, and SW options (Doppler, FSK and FMCW versions available)

Partner Modules using IFX Chip



Module (RF module; RF module + MCU including SW)

Benefits

- > Ease of design
- > Turn-key solution for customers with limited radar/RF/SW know-how

Recommended Radar Module Providers



Mclavis

- Millimeter Wave Key Solutions
- Email: mclavis@mclavis.com
- Website: In development
- Location: Seoul, Korea



Inzinious

- Email: mvsong@inzinious.com
- Website: <http://www.inzinious.com/>
- Location: Seoul, Korea



InnoSenT GmbH

- Innovative Radar Sensor Technology
- Email: info@innosent.de
- Website: <http://www.innosent.de/>
- Location: Donnersdorf, Germany



Annual General Meeting 2017

Thursday, 16 February 2017, 10.00 a.m. CET
ICM (Internationales Congress Center München),
Munich/Germany

[More information](#)



Infineon Partner Network

Welcome to the Infineon Partner Network! On these pages we want to introduce you to our global network of hardware, software, and service companies that can help our customers to speed up time to market. Infineon partners with carefully selected independent engineering companies offering tools, software, hardware, systems, services or training to assist our customers' design and implementation process. Our customers can select the right partner to speed up time to market for their project.

If you are looking for a distributor, please follow this link: > <http://www.infineon.com/where-to-buy>

Want to get in touch?

If you want to learn more about our Infineon Partner Network or want to get in touch with one of our partners to fasten time to market for your development project, please use the following links: > [Customer](#), > [Become a partner of Infineon](#)

	Infrastructure Infrastructure solutions
Development Tools ✕	End System
Software • Simulation/Modeling, IDEs, Flash Programming, Compilers, Debuggers, Test & Verification, ...	Software • Application Layers • Middleware & Libraries • Drivers & OS
Hardware • Logic Analyzers, PCB Layout Tools, Emulators, ...	Infineon Families • 8-bit 16-bit 32-bit • ARM Cortex-A Cortex-M • Power Pro Pro
	Semicon/Hardware • Power, PCB Integrable, Thermal/Inertness, LED, Delay Management, Other I

> [Infineon Partner Network Mo](#)

Infineon Partner Finder

Specify location

Region

Asia-Pacific ▾

Country

Select country ▾

Specify area of interest

Application

Select application ▾

Product Family

mm-Wave MMIC ▾

Specify type of service

Category

Select Category ▾

Refine search

Enter text here

12 partners found

To find more
information

인피니언 웨비나

인피니언의 24GHz ISM Band 트랜시버 MMIC 및 레이더 기술 소개 (2017년 3월 21일)

자세히 알아보기 >

인피니언은 생활의 편리함과 안전, 친환경을 추구합니다.

전 세계적인 인구 증가, 초대형 도시의 등장, 늘어나는 에너지 수요는 현대인들의 삶의 방식을 되돌아보게 합니다.

인피니언의 반도체와 시스템 솔루션은 더 편리하고 안전하며 친환경적인 미래를 구현하기 위해 기여합니다. 눈에 잘 보이지도 않을만큼 소형화된 반도체 부품들은 이제 우리 일상에 없어서는 안 될 부분이 되었습니다. 반도체 기술은 에너지 손실 없이 신재생 에너지를 전력망에 공급하고 컴퓨터의 소비 전력을 낮출 수 있도록 합니다. 또한 사이버 공간에 떠다니는 데이터를 보호하며 자동차의 에너지 효율을 더욱 높입니다.

> 인피니언 제품 포트폴리오 보기

인피니언소개

인피니언 테크놀로지스는 생활의 편리함과 안전, 그리고 친환경을 추구하는 세계 반도체 솔루션 시장의 선두주자이다. 인피니언의 마이크로 일렉트로닉스는 더 나은 미래를 위한 핵심 기술이다. 2016년 회계년도(9월 30일마감) 기준 인피니언은 전세계 약 36,300명의 직원들과 함께 65억 유로 매출을 달성하였다. 인피니언은 프랑크푸르트 증권거래소(거래심볼: IFX)와 미국 장외시장 OTCQX International Premier(거래심볼: IFNNY)에 등록되어 있다.

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Interface

Transistor & Diode

RF & Wireless Control Overview

Antenna Tuners

Antenna Switch Modules (ASM)

RF Transistor

RF Diode

RF Power (Broadcast, Basestation, Avionics, Radar Transistors & Amplifiers)

RF Switches (SPxT, DPxT)

Low Noise Amplifier (LNA)

RF Modules (LMM)

mmWave-MMIC (Transceivers 24-86 GHz)

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mmW Backhaul
Smart Service

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- RF (Radio Frequency) is a basic technology for all Infineon products and will become more and more important in future (acc. to Dr. Reinhard Ploss, CEO of Infineon Technologies in his Keynote-Speech at European Microwave Week October 2013)
- Focus Applications of the mmWave/Microwave RF transceivers of Infineon are Automotive Radar (e.g. Blind Spot detection@24GHz or ACC radar@77GHz) and Industrial Radar (e.g. Smart Lighting Sensor @24GHz), as well as Wireless Backhaul Communication of point-to-point basestations connections (e.g. V-band 60GHz or E-band 70/80GHz backhaul links)
- Infineon has developed 24, 60, 70, 80 GHz Transceiver with inhouse SiGe (Silicium Germanium technology which allows high integration level to minimize PCB real estate. The eWLB (embedded Wafer Level Ballgrid array) plasticpacking makes the difference to simply use standard SMT (Surface Mount Technology) production equipment, reducing the overall cost for such advanced systems in mmWave frequency range

RF Solutions for Wireless Infrastructure Backhaul	Industrial Radar Systems	Automotive Radar Systems
• E-band (71...76GHz and 81...86GHz) RF backhaul solutions for fast network expansion • V-band (57...64GHz) RF backhaul solutions for fast network expansion	• 24GHz multichannel RF-transceivers • Microcontrollers (XMC Family) • Single Chip Solution • Light Management	• 24GHz, 77-79GHz multichannel RF-transceivers • Microcontroller (Aurix Family) • Roadmap towards

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24GHz Radar – Industrial

Application Notes

Title	Size	Date	Version
AN305 - User's guide to 24GHz Radar Transceiver	787 KB	19 Nov 2012	01_00
AN341 - Using BGT24MTR11 in Low Power Applications - 24GHz Radar	990 KB	03 Dec 2013	01_00

Product Brief

Title	Size	Date	Version
Product Brief 24GHz Radar Chipset for Industrial Applications	386 KB	11 Jul 2014	
24GHz Radar Development Kit EN	338 KB	13 Feb 2015	01_01
Infineon-PB_Sense2Go_Development_Kit-PB-v02_00-EN EN	436 KB	10 Mar 2016	04_00

Article

Title	Size	Date	Version
Infineon-Article_EPR_Feb_2105-ART-v01_00-EN EN	1.8 MB	13 Feb 2015	01_00
"Single Chip 24GHz Radar Front End" Microwave Journal Feb 2014	101 KB	27 Feb 2014	

Product Brochure

Title	Size	Date	Version
Application Guide for Mobile Communication 2015 EN	3.1 MB	28 Oct 2015	01_01

Application Brochure

Title	Size	Date	Version
General Lighting Application Brochure EN	3.3 MB	01 Mar 2016	01_00

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Documents
Boards
Videos
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24GHz Radar – Industrial



24GHz - Intelligent motion sensor from Infineon with support from EBV

Christopher Cameron, Senior Product Marketing Manager at Infineon gives insights to the motion sensing environment enabled by 24GHz radar.

Lenght: 01:59 min



Intelligent sensors using 24GHz radar technology

This video introduces an intelligent sensor alternative to traditional passive infrared (PIR) sensors that are used for motion detection for applications such as lighting, security, and home automation.

Lenght: 24:11 min



Getting started with the 24GHz Sense2Go kit

This presentation walks the recipient of Infineon's Sense2Go2 24GHz RADAR development kit from opening the package and installing the tools in the enclosed USB stick, to connecting to the PC, and programming the board using DAVE. Using the XMC Link and DAVE4, we show the user how to import a project and display it on DAVE.

Lenght: 07:31 min



Arrow goes to Infineon to discuss their radar technology behind the Google Soli project

Arrow Electronics
2개월 전 · 조회수 1,715회



Infineon's Sense2Go Radar Application | Demo at embedded world 2015

www.elektor.tv
1년 전 · 조회수 3,682회
For the lazy in us all, automatic doors are awesome. But why the heck they open also when you're just passing by, walking down ...



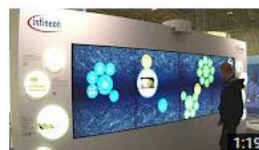
Infineon's 24GHz Radar Solutions - Infineon Technologies

InfineonTechnologies
2년 전 · 조회수 1,520회
You can use Infineon 24GHz radar in a smart way to track objects – moving or static – and detect the direction/angle, the ...



Welcome to Project Soli

Google ATAP
1년 전 · 조회수 3,571,417회
Project Soli is developing a new interaction sensor using radar technology. The sensor can track sub-millimeter motions at high ...



Infineon / Radar Touch Dokumentation

tennagelsMT
1년 전 · 조회수 475회
tennagels Medientechnik, Düsseldorf tennagels.com.



Infineon's stunning High-Performance & Low Energy Solutions

EBV Elektronik
1년 전 · 조회수 944회
Maurizio Skerlj, Senior Director Microcontroller Industrial & Multimarket at Infineon introduces the technology and demos ...



IWPC Testimonial - Dr. Rudolf Lachner, Infineon, Auto Radar Workshop, Dec 2009

dbbrown2
2년 전 · 조회수 118회
IWPC Testimonial - Dr. Rudolf Lachner, Infineon, Auto Radar Workshop, Dec 2009.



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