

XENSIV™

24 GHz radar sensors

The BGT24Mxx is a highly integrated 24 GHz ISM band radar transceiver family

The BGT24Mxx transceiver family saves up to 30 % board space compared to discrete line ups. Infineon offers 3 different components, the BGT24MTR11 which combines one transmit- and one receive channel, the BGT24MTR12 which comprises one transmit- and 2 receive channels, and the BGT24MR2, a chip with 2 receive channels, combinable with both chipsets. All transceivers are manufactured in Infineon's proprietary SiGe BiCMOS technology for optimized RF performance.

24 GHz radar sensors are used in a variety of industrial and consumer applications, where accurate and reliable sensing capabilities are required.

Exemplary applications:

- **Smart home:** Detect movements and presence of humans to automatically control lighting and other smart home systems for enhanced user experience and energy saving
- **HVAC systems:** Automatic turn on and turn off, people positioning for airflow management
- **Outdoor and industrial lighting:** Automatic turn on and off based on human movements
- **Security and surveillance systems:** Detect and track intruders on even the smallest movements for enhanced security and safety
- **Industrial automation:** Detect objects, measure distances, monitor machinery movements and more for efficient and safe operation
- **Traffic monitoring:** Detect vehicles and measure their speed for real-time traffic flow analysis and optimization
- **Multicopters, drones and service robots:** Distance measurement for collision avoidance and landing control
- **Level sensing:** Level measurement and monitoring in tanks and containers for liquids and non-liquids

In an industrial environment, energy efficiency becomes more and more important. At the same time, certain health and safety regulations have to be observed. Thanks to Infineon's XENSIV™ 24 GHz radar product family BGT24Mxx, these needs can be addressed. The BGT24MTR11 makes it possible to have products in applications with a far higher sensitivity than were previously possible with other sensors. In addition to movement, radar sensors can also detect direction and speed. This makes it possible, for example, for automatic doors to open only when a person continuously approaches them and not every time someone moves nearby or even just walks past them. Where it is important to detect also the position of the person or object in the area, the BGT24MTR12 or a combination of one transceiver chip with the BGT24MR2 is the ideal choice.

The high integration of the Infineon solution – transmit channel and receive channel on one chip – saves expensive PCB space and makes the design easy as no 24 GHz RF-matching/RF-transmission lines are required. The industrial standard VQFN package can be mounted in standard SMD lines.

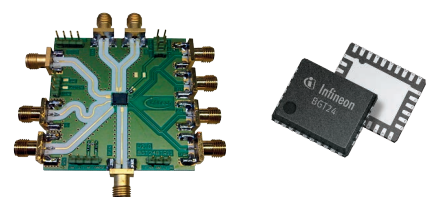
Features

- Temperature range: -40 ~ 105 °C
- Detection range > 100 m @ 500 mW power consumption
- Accuracy in mm-range for near field
- Fully integrated solution, only 1 external blocking-C required
- Enabler to use standard Di-electric PCB-material (Rogers) and assembly lines for reducing design-cycle time and production cost by a factor of ~4

Why Infineon's 24 GHz solution?

- High integration (1 chip for transmitting & receiving)
 - Opens up new markets
 - Less PCB space required
- No 24 GHz RF-matching/ RF-transmission lines required on PCB
 - Ease of use
 - Easy PCB design
- Industry standard QFN-style package for mounting in standard SMD-lines
 - All kinds of customers can be targeted, no special technologies are required
- Roadmap approach
 - Looking into future requirements

Highly integrated 24 GHz single die RF solution



PRODUCT BRIEF

Typical electrical characterisation $T_A = -40 \dots 105 \text{ }^\circ\text{C}$

Parameter	Symbol	Values			Unit	Note / Test condition
		BGT24MR2	BGT24MTR11	BGT24MTR12		
		2 Rx	1 Tx / 1 Rx	1 Tx / 2 Rx		

Power supply

Supply voltage	V_{CC}	3.135 ... 3.465	3.135 ... 3.465	3.135 ... 3.465	V	–
Supply current	I_{CC}	90	150	200	mA	–

TX section

VCO frequency range	f_{VCO}	–	24.00 ... 26.00	24.00 ... 26.00	GHz	–
VCO tuning voltage	$V_{FINE}, V_{FCourse}$	–	0.5 ... 5.0	0.5 ... 5.0	V	–
VCO tuning slope fine	$\Delta f / \Delta V_{FINE}$	–	< 1000	< 1000	MHz/V	–
VCO tuning slope coarse	$\Delta f / \Delta V_{FCourse}$	–	< 1800	< 1800	MHz/V	–
VCO pushing	$\Delta f / \Delta V_{CC}$	–	< 300	< 300	MHz/V	@ f = 24 GHz
VCO phase noise	P_N	–	-85	-85	dBc/Hz	–
TX output power	P_{TX}	–	8	8	dBm	–
TX output power adjustable range	a_{TX}	–	9	9	dB	Adjustable via SPI
TX output power in “off” mode	P_{TXoff}	–	< -15	< -15	dBm	–
LO output power	P_{LO}	–	0	–	dBm	–

RX section

RFIN frequency range	f_{RFIN}	24.00 ... 26.00	24.00 ... 26.00	24.00 ... 26.00	GHz	–
IF frequency range	f_{IF}	< 1	< 1	< 1	MHz	–
Voltage conversion gain	G_C	26	26	26	dB	$R_{LOAD,IF} > 10 \text{ k}\Omega$
SSB noise figure	NF_{SSB}	11	11	12	dB	Single sideband at 100 kHz
IF 1/f corner frequency	f_C	10	10	10	kHz	–
Input compression point	P_{1dB}	-12	-12	-12	dBm	–
Quadrature phase imbalance	ϵ_P	< 10	< 10	< 10	deg	–
Quadrature amplitude imbalance	ϵ_A	< 1	< 1	< 1	dB	–



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