**SINGLE ANTENNA FMCW RADAR FRONT-END**

- **Ref-Nr:** TA-11037/TUB

**HINTERGRUND**

Considering lower requirements for transmission power, lower hardware complexity but by simultaneously greater robustness, frequency modulated continuous wave (FMCW) radar systems comprise one solution as a compact embodiment of an integrated circuit for the front end of the radar system. Such systems can be deployed in large numbers, both in the automotive industry as well as in telecommunications.

**PROBLEMSTELLUNG**

Common techniques to solve the problems of single antenna front-ends – especially the demand for high isolation to ensure a continuous operation mode – are duplex switches or circulators at the front-end for connecting the antenna between transmitter and receiver. However, such solutions still have their disadvantages. The power handling capacity of the switches, and the loss encountered in them, degrades both the performance of the transmitter and the performance of the receiver. Therefore, with such implementations it is very hard to create compact modules with small form factors.

**LÖSUNG**

This new technology enables the utilization of an improved isolation method for integrated circuits in the high frequency transceiver front-end of a FMCW radar system.

To achieve this improvement, two circuit processes (turning on and off of receiver and transmitter) are synchronized with each other. The synchronization improves the isolation properties considerably, which leads to significantly better transmitting characteristics. A further advantage of the proposed technology are improved isolation characteristics of the receive signal that are by several dimensions smaller than the transmitter signal. Thus, it is possible to utilize an...
asymmetrical setup of the RF-switch that reflects the unequal patterns of the transmitting and of the receiving signal.

Schematic representation with a block diagram of an FMCW radar transceiver (FMCW = frequency modulated continuous wave) with an antenna 1, a band-pass filter 2 that is connected to it (BPF = band-pass filter), and a voltage-controlled oscillator 3 (VCO = voltage-controlled oscillator). Between the band-pass filter 2 and the voltage-controlled oscillator 3 is formed a circuit arrangement 4, which is connected via a signal terminal 5 for purposes of signal exchange with the band-pass filter 2, and via a further terminal 6 for purposes of signal exchange with the voltage-controlled oscillator 3. With the circuit arrangement 4 is formed a front end for the FMCW radar transceiver in a single antenna embodiment. The FMCW radar transceiver can be operated in a transmission mode of operation for purposes of sending signals via the antenna 1. In a reception mode of operation signals can be received via the antenna 1. The switchover between the modes of operation that are operating at separate times takes place with the aid of the circuit arrangement 4.

**VORTEILE**

- High isolation between transceiver & receiver without any external
switches
• Higher isolation allows designs below 1 mm²
• Easily suitable for mass production
• Prototypic chips exist

ANWENDUNGSBEREICHE

The presented technology could be used in (wireless) communication for local positioning systems (e.g., museums, harbors) and for distance detection systems in cars.

SERVICE

Chances for Collaboration:

• R&D Cooperation
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