

## Ultra-low-power 60 GHz radar-on-chip

Short-range radar has many potential applications, such as gesture control, contactless vital-signs monitoring, presence detection, and more. Some radar-on-chip solutions that integrate signal processing and RF components are available today, but most of them are designed for automotive anti-collision applications that require long-range detection and higher power consumption. These solutions are not suitable for low-power or low-cost applications.

CSEM has developed a low-cost, ultra-low-power 60 GHz MIMO FMCW PHY that can be integrated into radar-on-chips with custom digital processing for specific applications. This solution leverages CSEM's decades of experience in ultra-low-power RF CMOS system-on-chip design.

### Applications

- Gesture control/human interface
- Contactless vital-signs monitoring
- Presence detection for building management systems
- In-vehicle presence detection

### Architecture and target specifications

- ADPLL with 57-66 GHz I&Q DCO
- Scalable LO distribution and **< 0.4 mm<sup>2</sup> per Rx & Tx slice**
- Integrated current and voltage references, LDOs and digital control
- 16 mW for 57-66 GHz LO + 7.2 mW per Rx + 13.6 mW per Tx. **(40 mW 1T1R & 100 mW 4T4R)**
- Min. **0.5 ms** frequency ramp time (chirp) linearized by PLL lock-in
- Fast start-up for power-efficient **activity duty-cycling**
- 1 Mchip/s < BPSK < 10 Mchip/s

