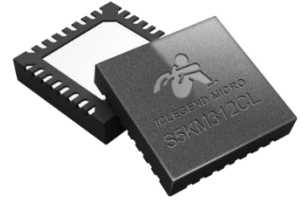


S5KM312CL



1 General Description

The S5KM312CL is an integrated single-chip mmWave sensor SoC based on FMCW radar transceiver technology. It works in the 24 GHz K-band with up to 4 GHz modulation bandwidth in each single frequency sweeping chirp.

The S5KM312CL offers a low-cost fully integrated solution for all critical mmWave functions with full transceiver and signal processing path, including full K-band RF transceiver, on-chip pattern generator, PLL, and ADCs. The pattern generator supports multiple frequency sweeping modes with different time-frequency waveforms, e.g. saw-tooth and triangular waveforms. The pattern generator and PLL support fast chirp mode up to 8 kHz chirp rate. The digitized signals from the receiver chain can be serialized via multiple output interfaces. The device supports full cascading for higher angular resolution applications.

The device is packaged in a 32 pin 4 mm x 4 mm leadless ROHS compliant QFN package for easy interfacing to a wide range of antenna board technologies.

2 Main Features

- 24 GHz K-band highly integrated FMCW radar sensor SoC
- Up to 4 GHz bandwidth FM tuning range
- Integrated signal generator, low phase noise PLL, transmitter, receivers, baseband and ADCs
- One transmit channel and two receive channels
- TX maximum output power: 12 dBm
- RX noise figure: 10.5 dB
- Phase noise @ 1 MHz offset: -97 dBc/Hz
- Built-in 2.5 MHz throughput rate ADC with 16 bits resolution
- Support multi-devices cascading applications
- Built-in hardware accelerator for FFT and filtering
- Chip configuration interface supports: I2C/SPI/UART
- Data output interface supports: SPI/UART/RAW data
- Support flexible power supply modes
- Easy hardware design: 4 × 4 mm² QFN32 package for ultra-compact and low-cost PCB design
- Junction temperature range of -40°C to 105°C

3 Applications

- Smart Home Radar sensor
- Robotics
- Proximity and Position sensor
- Motion detector
- Gesture recognition
- Vital signs monitoring

4 Block Diagram

The RF and analog subsystem implements the FMCW (frequency-modulated continuous-wave) transceiver system with one transmitter (TX), two receivers (RX1 and RX2), synthesizer, mixer, and baseband. Gain controls are applied to both transmitter and receiver to adjust the whole link budget to work in different scenarios. The baseband section includes intermediate frequency (IF) amplifier, filter and ADC. A built-in DSP accelerator can process the IQ ADC's raw data with Range FFT or Doppler FFT.

S5KM312CL supports full cascading applications, offering separate LOBUF_IN and LOBUF_OUT connections, separate 25 MHz clock inputs and output connections. The pattern generator and PLL support fast chirp mode up to 8 kHz chirp rate.

S5KM312CL can be configured via I2C/SPI/UART interface, RAW data can be directly outputted via GPIO mode, DSP processed data can be serialized and outputted via SPI/UART interface.

Figure 4-1 presents the illustration of the design of S5KM312CL.

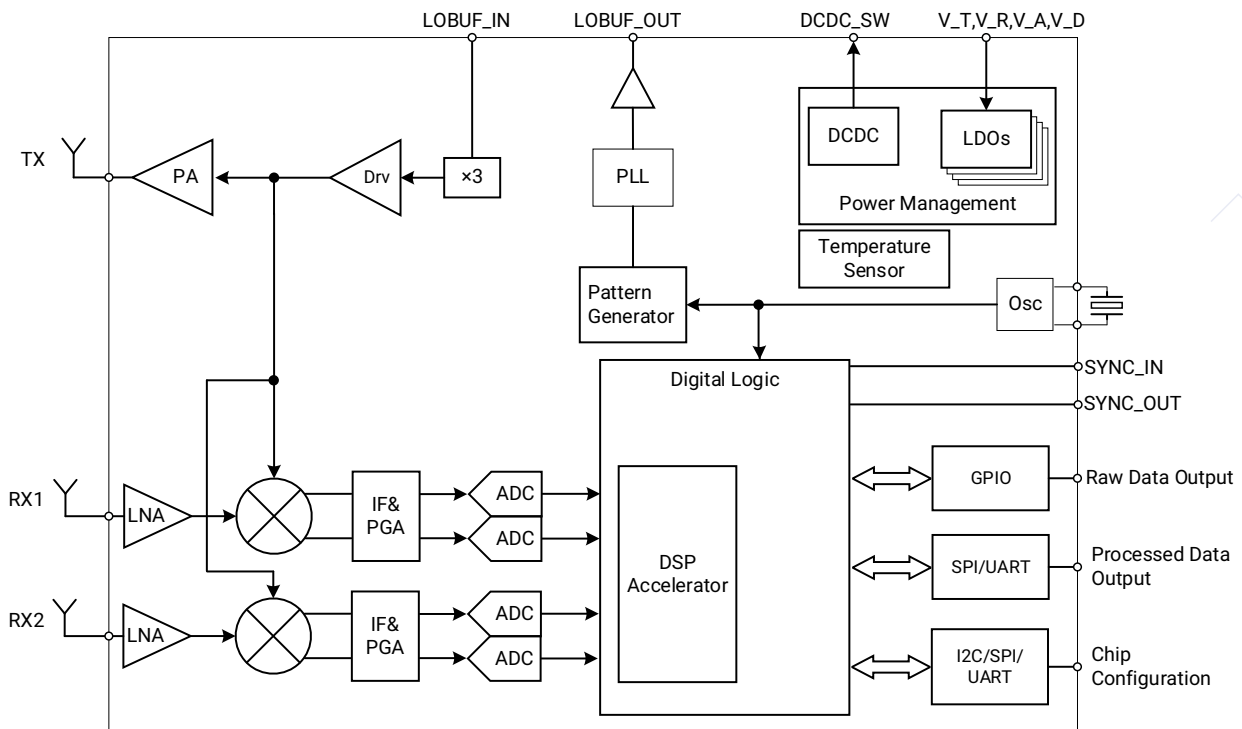


Figure 4-1 S5KM312CL block diagram