



Fraunhofer IMS

FRAUNHOFER INSTITUTE FOR MICROELECTRONIC CIRCUITS AND SYSTEMS IMS



1 Acoustic time-of-flight measurement ICs.

HIGH-RESOLUTION DELAY MEASUREMENT IN YOUR ASIC

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Time-domain sensor applications

Many sensing tasks can be accomplished by a high accuracy time-delay measurement. Popular examples are time-of-flight measurements of light- or acoustic waves in LIDAR and magnetostrictive positioning applications respectively. Sensing of capacitances, of signal frequencies and phase shift are other applications which can be dealt with in the time-domain.

Time-to-digital-converters and high accuracy analog integrators are the basic building blocks for electronic time-measurement beyond the resolution of the system clock. Although several time-measurement ICs are available of-the-shelf, they usually leave the crucial tasks of signal preconditioning and supply and reference stabilization in the responsibility of the board-level developer. With operating environments tending to be more demanding in terms of temperature, functional safety requirements or low energy budget, customer-tailored ASIC solutions which tightly integrate a time-

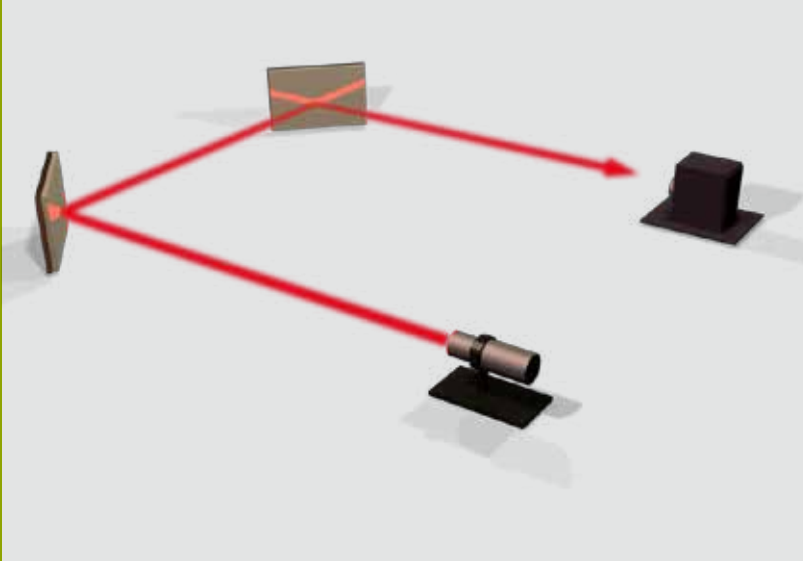
measurement core with application specific analog or digital signal processing and customer defined interfaces are more and more attractive for even medium volume products.

Fraunhofer solutions

Fraunhofer IMS provides sensor-readout ASIC solutions based on our growing family of time-measurement cores – predeveloped circuit components which have already successfully been integrated into industrial sensing ICs. These cores can be extended with the analog signal conditioning, digital processing and interface options most appropriate for your application.

Our family of time-measurement cores includes Time-to-Digital converters in various configurations: low-power cores for battery powered applications, high resolution cores for precision and TDCs which can process an arbitrary number of incoming return signals («Hits») at a high rate. We can offer analog high-precision integrator based solutions, either single or dual-slope, to





achieve a minimum area solution or to offer configurability through choice of external components.

Technology base

Our development is focused on our 0,35 μm in-house automotive certified CMOS processes offering a range of high-voltage and high-temperature options as well as a seamless integration with customer-specific post-processing steps. With our in-house testing capability and reliability testing equipment we are able to offer you a turn-key solution for small to medium volume fabrication.

Overview of Fraunhofer IMS time-measurement cores

Time-to-Digital-Converters (TDC)

- resolutions down to 60 ps
- output rate up to 200 ksp/s
- measurement rate up to 20 ms for high resolutions, up to seconds with reduced accuracy
- temperature range -20 up to 85 °C, -40 up to 125 °C, -40 up to 150 °C

Analog integrator based time measurement

- linearity error < 0,005 %
- ISO 26262 / ISO 61508 specific diagnosis and redundancy features
- high voltage I/O up to 36V
- multi-channel