

## High Performance Packaging

# Universal Sensor Platform (USEP) A Unique Selling Point

### Fast Facts

1. Advanced RDL-1st FanOut WLP for sensors and IoT with PoP sensor mounts
2. Package size: 10 x 10 mm<sup>2</sup> with customer-specific layouts on top side
3. Embedded SoC manufactured in 22FDX technology from Globalfoundries
4. 400 signal connector to FPGA development platform

Current technology and product roadmaps, such as those of the Central Association of the Electronics Industry (ZVEI) or the Institute of Electrical and Electronics Engineers (IEEE), reveal two major system integration factors for IoT sensor nodes:

First, the trend towards a higher number of functionalities which are directly combined in one system including optical, mechanical, biological and chemical functions (in addition to electrical functionalities), combined with demand for higher reliability and longer service life of the systems. Second, the trend towards the fusion of product and electronics which requires a strong miniaturization of such systems to measure physical parameters and locally process the measured data.

The USEP module incorporates both factors as the combination of various sensing options and the integration of a powerful SoC for edge computing are available.

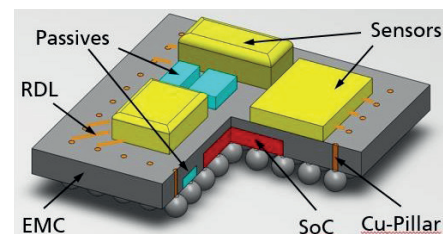
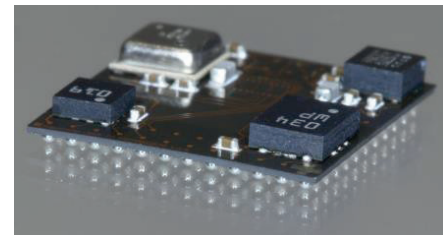
The core of the USEP modul is a System-on-Chip (SoC) manufactured in 22FDX technology from Globalfoundries as a central control and computing unit. A variety of pre-calibrated sensors for different measurement variables (e.g. pressure, temperature, acceleration, gas, ...) are available to be mounted onto a individually customizable top side redistribution layer (RDL) enabling a high variant diversity. Further sensors can be connected to additional analog and digital interfaces via a motherboard that includes wireless communication and energy supply as well.

An automated design flow ensures an efficient implementation of customer-specific layouts. The packaging/hardware integration concept derives an integration and manufacturing concept of 4 levels from the demand for a highly integrated and individualized production of sensor systems:

- Level 0: SoC core
- Level 1: system core (embedded SoC core)
- Level 2: functionality on system core (PoP with RDL last)
- Level 3: system board with embedded system

The SoCs are equipped with a standardized interface for solder mounting on circuit carriers (RDL-first with BGA pinout), which is supplemented by a customizable placement layer (RDL last) on top of the module.

Production is carried out on 300 mm wafers, module size is 10 × 10 mm<sup>2</sup> – customer-specific layouts on the top side of the package can be economically realized using laser direct imaging (LDI) lithography on module top side enabling custom layouts even for low wafer counts.



Top: USEP module with pressure, gas, temperature, and acceleration sensor  
Bottom: Cross sectional view on a USEP module

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www.izm.fraunhofer.de 05/2023