

IMEC reports ultra-thin chip embedding for wearable electronics

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At today's Smart Systems Integration Conference in Brussels (Belgium), technologists from IMEC and its associated laboratory at Ghent University present a new 3D integration process enabling flexible electronic systems with a thickness of less than 60 micrometer. This ultra-thin chip package (UTCP) technology allows integrating complete systems in a conventional low-cost flex substrate. This paves the way to low-cost, unobtrusive wearable electronics for e.g. wearable health and comfort monitoring.



For the integration, the chip is first thinned down to 25 micron and embedded in a flexible ultra-thin chip package. Next, the package is embedded in a standard double-layer flex printed circuit board (PCB) using standard flex PCB production techniques. After embedding, other components can be mounted above and below the embedded chip, leading to a high-density integration.

The integration process uses UTCP interposers which solve the "Known Good Die" issue by enabling easy testing of the packaged thin dies before embedding. Expensive high-density flexible substrates can be avoided by the fan-out UTCP technology which relaxes the interconnection pitch from 100µm or lower to 300µm or more, compatible with standard flex substrates.

IMEC demonstrates the integration technology with a prototype flexible wireless monitor that measures the heart rate (electrocardiogram or ECG) and muscle activity (electromyogram or EMG). The system consists of an embedded ultra-thin chip for the microcontroller and analog-to-digital convertor, an ultra-low power biopotential amplifier chip and a radio transceiver. By thinning down the chips for UTCP embedding, they become mechanically flexible resulting in an increased flexibility of the complete system, making it unobtrusive and comfortable to wear.

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