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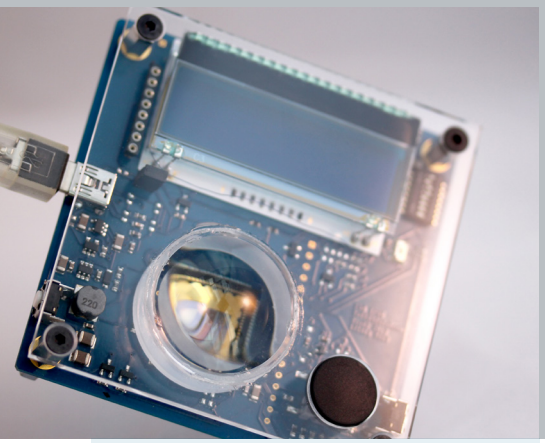
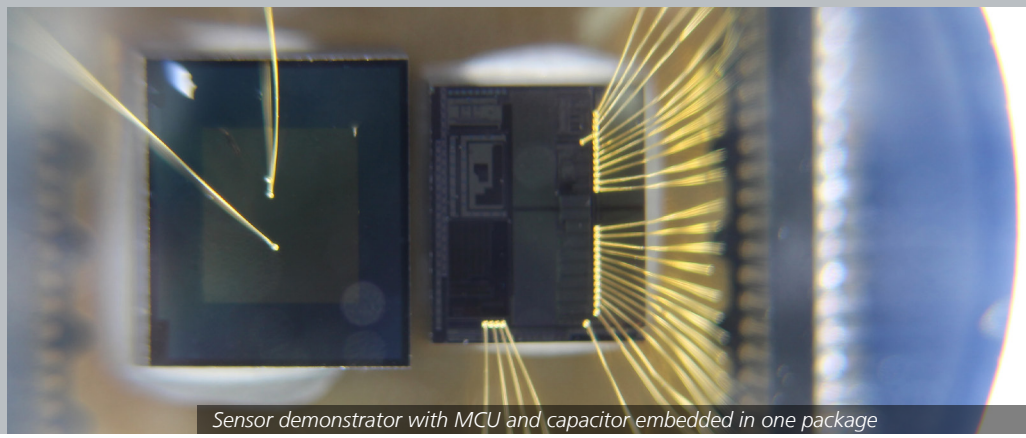
FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS IPMS
CENTER NANOELECTRONIC TECHNOLOGIES (CNT)





Sensor demonstrator with MCU and capacitor embedded in one package

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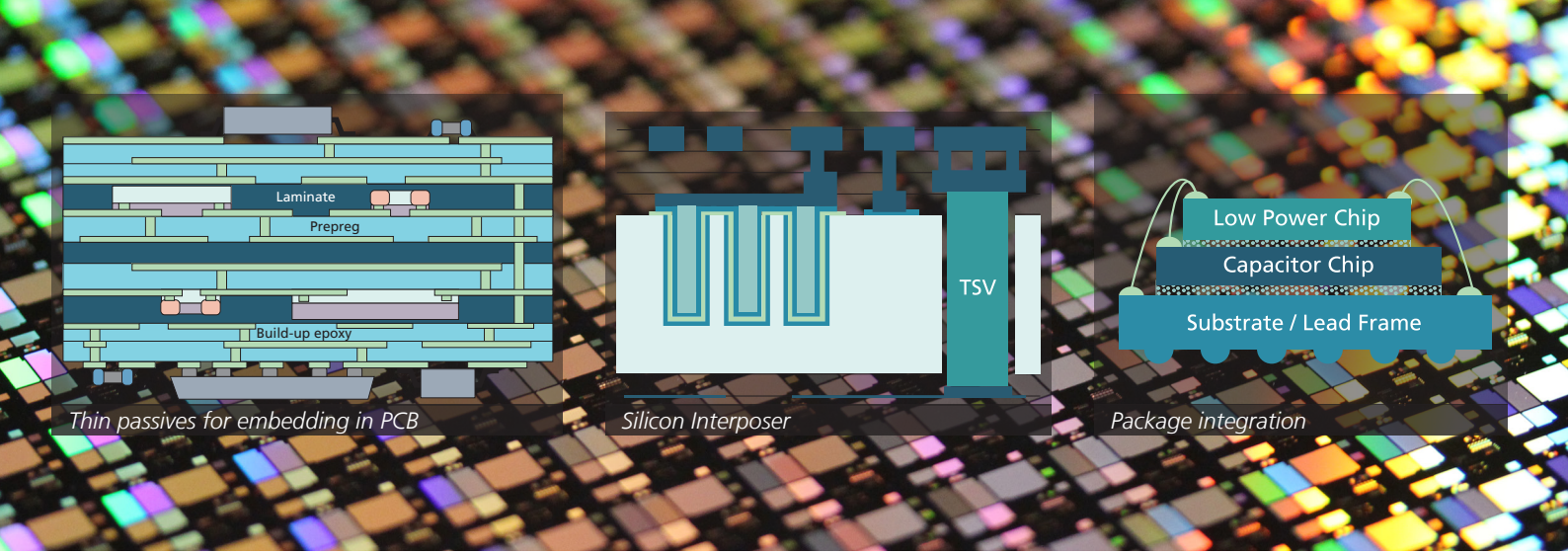
ULTRA-THIN HIGH DENSITY SILICON CAPACITORS

FOR ADVANCED PACKAGING SOLUTIONS

The growing demand for miniaturized system solutions requires more and more different functional blocks to be compacted into single chip casing or on small substrates. Intelligent solutions for the integration of passive components are needed in order to avoid space intensive external wiring and to mitigate parasitic effects. For instance decoupling capacitors must be placed as close as possible to active circuits in order to suppress crosstalk between different power supply levels. In addition, more and more sensor circuits with active components are applied in harsh environment requiring local energy buffering in order to maintain stable system power supply. Such local energy buffering is preferably performed by capacitors with high capacitance values.

The Fraunhofer IPMS has developed an ultra-compact capacitor with high capacitance density for direct integrated circuit packaging. The product is a passive component. In addition to available standard types, the design and electrical properties can be adjusted to customer's requirements covering a large range of capacitance values by using innovative high-k dielectrics and special patterning processes. This capacitor technology platform is suited for the system in package (SiP) integration as well as for high-end printed circuit boards or interposers. The capacitor fabrication is based on standard semiconductor wafer processing environment offering the advantage of very precise high quality manufacturing and small dimensions.



APPLICATIONS

Beyond the discrete capacitor components, Fraunhofer IPMS in cooperation with partners is offering solutions for various customized system integration options:

- Direct integration in chip package
- Interposer and PCB embedding
- Decoupling and buffering

DIMENSIONS AND TERMINALS

- 0402 format: 100 pF – 100 nF
- Custom format: 0.5 – 6 µF
- Thickness: down to 50 µm
- Smallest package outline: 01005 (0402 metric)
- Cu/Au or Al terminals
- Terminal options:
  - Two contacts on front-side
  - One terminal on front- and backside

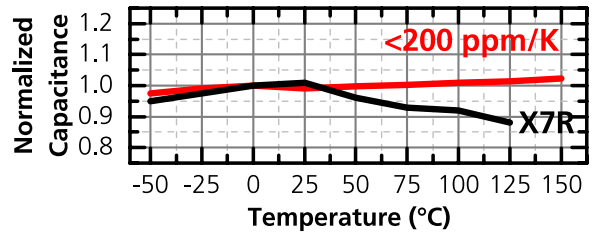
CAPACITANCE		VOLTAGE RATING		
VALUE	RANGE	3 V	5 V	15 V
1	nF	samples	samples	on request
2.2	nF	samples	samples	on request
3.3	nF	samples	samples	on request
4.7	nF	samples	samples	on request
6.8	nF	samples	samples	on request
10	nF	samples	samples	on request
15	nF	samples	samples	on request
22	nF	samples	samples	
33	nF	samples	samples	
47	nF	samples	samples	
68	nF	samples	on request	
100	nF	samples	on request	
150	nF	samples	on request	
220	nF	on request	on request	
680	nF	on request	on request	
1	µF	on request	on request	
2	µF	on request	on request	
4	µF	on request		
6	µF	on request		

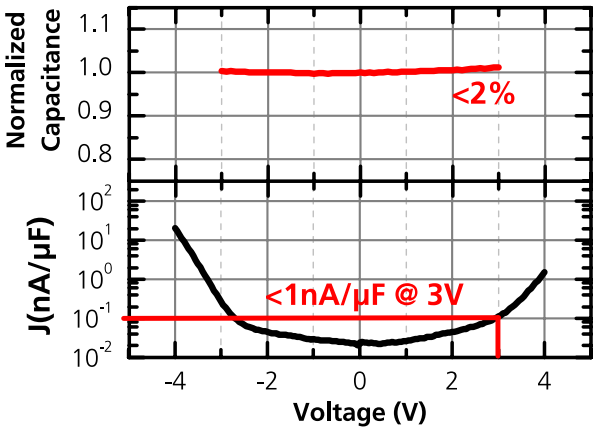
TECHNOLOGY

- Semiconductor manufacturing precision
- Highest capacitance density
- Voltage and temperature stability
- Low profile

PERFORMANCE

- Low temperature coefficient for all materials
- Stable capacitance over voltage
- Low leakage current density
- Breakdown voltage stable over wide temperature range
- More than 10 years characteristic lifetime





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