



Innovative Ultra-Miniature Ring Oscillator **Temperature Sensor**



The Problem

An important power management functions in commercial IC's is temperature sensing. Since commercial processors can have as many as 40 sensors, the industry is constantly pursuing a small, low power sensor.



The Solution

We present a promising, novel ultra-miniature ring-oscillator sensor which at 750 um² is the world's smallest integrated smart sensor and has the one of the lowest energy consumptions.



The Commercial Benefit

Our temperature sensor:

- Is the world's smallest integrated smart sensor,
- Has an ultra-low energy consumption of 0.1 nJ/conversion,
- Generates a linear temperature dependent frequency which can easily be compared to a reference frequency.



Market Potential

The temperature sensors market is expected to be valued at USD 6.86 Billion by 2023, at a CAGR of 4.5% between 2017 and 2023. The major factors driving growth of this market include the increasing demand for advanced and portable healthcare equipment and the growing automotive sector.



Target Markets/Industries

- Automotive sector,
- Healthcare equipment market,
- Consumer electronics market,
- Aerospace & defense industry,
- Food & beverages industry (storage and transportation of food products),
- HVAC systems market.



Intellectual Property

Patent pending



Team: Primary Inventor

Prof. Joseph Shor

- Prof. Shor is presently an Associate Professor of Electrical Engineering at Bar Ilan University, and a Senior Member of the IEEE.
- Prof. Shor has published more than 60 papers in refereed Journals and Conference Proceedings in the areas of Analog Circuit Design and Device Physics.
- Prof. Joseph Shor holds > 40 issued patents and several pending patents.
- Prof. Shor was at Intel Corporation, as a Principal Engineer, and head of the Analog Team at Intel Yakum.



Future Research

This is the world's smallest temperature sensor and one of the most energy efficient. We are continuing its development in order to improve the sensing accuracy and resolution, as well as the sensing speed and energy efficiency. We are also attempting to add functionality to the circuit, such as reference voltage generation.



The Opportunity

Companies are welcome to license our patent through a licensing agreement or through sponsored research.



Keywords

- Thermal Sensor,
- Power management,
- Smart sensor,
- Ring oscillator.